



CORONAVIRUS DISEASE 2019 (COVID 2019)

Advisory on the management of patients with renal
disease

JIPMER



Department of Nephrology, JIPMER

Version 1

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DISCLAIMER

This advisory aims to provide general suggestions regarding the management of renal disease patients with suspected/confirmed coronavirus disease (COVID-19) or vice versa. Being a new disease, this advisory is based on pertinent medical literature, national and institutional (JIPMER) policies, and/or expert consensus. The content is not meant to be complete, exhaustive, or a substitute for professional medical advice, diagnosis, and treatment and is not a replacement for a qualified medical professional's judgment. The information presented herein should be adapted to each patient based on independent professional assessment and consideration of the patient's needs. As knowledge of the corona virus disease evolves, updating of the current recommendations would be appropriate.

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1. INTRODUCTION

Corona virus disease 2019 (COVID-2019) is a global human threat. It is caused by severe acute respiratory syndrome (SARS) coronavirus (CoV)-2 and manifests primarily as an acute respiratory illness. However, it can present with multiple organ involvement. The pathogenesis of renal involvement is yet to be elucidated. Some proposed mechanisms include sepsis leading to cytokine storm syndrome or a direct cytopathic effect of the virus(1). The prevalence of renal involvement in patients with COVID-19 appears to be high, based on recent reports (2). The incidence of acute kidney injury (AKI) is reported to be around 0.5 to 7%(3–6). AKI is an independent risk factor for in-hospital mortality. Proteinuria was identified in 44% and hematuria 26.7% in a prospective cohort study(2). The impact of COVID-19 on chronic kidney disease has not been reported. However, the incidence of AKI was significantly higher in patients with elevated baseline serum creatinine (11.9%) compared to patients with normal baseline creatinine (4%)(2). Underlying chronic kidney disease has also shown to be associated with severe illness and higher mortality. Early detection and prompt management of the renal disease is of prime importance.

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2. DIAGNOSTIC TESTING

The testing strategy for a patient suspected to have COVID-19, and renal disease shall be in lines with the revised ICMR recommendations (version 3, dated 20-3-2020) and JIPMER COVID-19 Taskforce standard operating procedures, version 1(24-03-2020).

- i. Asymptomatic individuals who have undertaken international travel in the last 14 days: They should stay in home quarantine for 14 days and they should be tested only if they become symptomatic (fever, cough, difficulty in breathing). All family members living with a confirmed case should be home quarantined.
- ii. All symptomatic contacts of laboratory-confirmed cases.
- iii. All symptomatic health care workers.
- iv. All hospitalized patients with Severe Acute Respiratory Illness (fever AND cough and/or shortness of breath).
- v. Asymptomatic direct and high-risk contacts of a confirmed case should be tested once between day 5 and day 14 of coming in his/her contact. (Direct and high-risk contact includes those who live in the same household with a confirmed case and healthcare workers who examined a confirmed case without adequate protection as per WHO).

The above testing strategy shall be followed for patients with chronic kidney disease, acute kidney injury, hemodialysis patients, peritoneal dialysis patients, and renal transplant recipients.

The case definitions of a suspected case, confirmed case, and contact (high risk and low risk) shall be followed as defined in the JIPMER COVID-19 Taskforce standard operating procedures, version 1(24-03-2020). Updated definitions shall be developed as revisions are made.

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3. MANAGEMENT OF ACUTE KIDNEY INJURY IN COVID-19 PATIENTS

3.1 Definition:

Acute kidney injury is defined by the KDIGO (Kidney disease improving global outcomes) consensus criteria as any of the following(7):

- a. Increase in serum creatinine by ≥ 0.3 mg/dL within 48 hours; or
- b. Increase in serum creatinine to ≥ 1.5 times baseline, which is known or presumed to have occurred within the prior 7 days, or
- c. Urine volume < 0.5 ml/kg/hr for 6 hours.

3.2 Staging of AKI (KDIGO):

Stage	Serum creatinine	Urine output
1	1.5–1.9 times baseline OR ≥ 0.3 mg/dl (≥ 26.5 μ mol/l) increase	< 0.5 ml/kg/h for 6–12 hours
2	2.0–2.9 times baseline	< 0.5 ml/kg/h for ≥ 12 hours
3	3.0 times baseline OR Increase in serum creatinine to ≥ 4.0 mg/dl (≥ 353.6 μ mol/l) OR Initiation of renal replacement therapy OR, In patients < 18 years, decrease in eGFR to < 35 ml/min per 1.73 m ²	< 0.3 ml/kg/h for ≥ 24 hours OR Anuria for ≥ 12 hours

Frequent monitoring of renal functions, daily fluid intake, and urine output is recommended for all patients to enable early detection of AKI.

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3.3 General principles of AKI management:

1. Avoid/discontinue **potential nephrotoxic medications** including Non-steroidal anti-inflammatory drugs (NSAIDs), aminoglycosides, vancomycin, ACE-I/ARBs, Metformin and contrast agents.
2. **Optimize the blood pressure:** target a mean arterial pressure of 65-70mm hg. This could be achieved by fluid resuscitation and use of vasopressors.
3. Consider inserting an **indwelling bladder catheter** if clinically indicated and other ways of measuring urine output are not possible.
4. **Diuretics** are not routinely recommended to prevent the development of AKI. However, diuretics could be used for volume management in patients with AKI.
5. **Blood glucose** should be maintained between 110mg/dL to 180mg/dL. Two consecutive blood sugar values above 180mg/dL should prompt the initiation of insulin therapy for control of the same. Oral antidiabetic agents should be stopped.
6. **Fluid intake** should be limited to the previous day's output + 500ml (400-600ml) to account for insensible water loss. This should include the fluids administered along with medications. Balanced crystalloids or normal saline can be used for fluid resuscitation. Ringer lactate is better avoided in the presence of hyperkalemia. Maintenance IV fluids are better avoided in patients with AKI unless there is hypovolemia or the patient is unable to tolerate oral feeds. The maintenance fluid requirement for adults with normal kidney function is roughly 1.5 to 2L per day. These requirements might be lower in patients with oliguria. In ventilated ARDS patients, a conservative fluid strategy (dry lungs) may be followed. Blood transfusions in patients with acute kidney injury, when indicated, should be done cautiously and could preferably be given during dialysis in patients with oliguria/anuria requiring dialysis.
7. **The fluid and electrolyte requirements** should be assessed daily throughout hospitalization. During the oliguric phase, the daily sodium intake should be restricted to less than 100meq of sodium (2g of sodium or 4.5g of sodium

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chloride). The daily potassium intake should be limited to 2g/day unless there is hyperkalemia. The daily phosphorous intake should be restricted to 800-1000mg.

8. **Nutrition** of patients with AKI should be adequately addressed. Enteral nutrition is preferred unless there is a medical contraindication. Total average energy intake of 25 kcal/kg/day (non-protein calories) is recommended for patients with any stage of AKI. It is not recommended to reduce protein intake to delay dialysis. A protein intake of 0.8-1g/kg/d is recommended for patients with non-catabolic AKI without need for dialysis, 1-1.5g/kg/d in patients requiring renal replacement therapy and up to a maximum of 1.7g/kg/d in patients on continuous renal replacement therapy (CRRT) and in hyper catabolic patients.
9. **Adequately manage complications** associated with AKI, including hyperkalemia, volume overload, and metabolic acidosis. The use of sodium bicarbonate for the management of metabolic acidosis in AKI is unproven and discouraged.
10. **Renal failure alters drug handling.** The drugs predominantly excreted by the kidney require dose modification in AKI (Table 1.). For drugs removed during dialysis, an extra dose (50% of the prescribed individual dose) should be given at the end of the dialysis session or during CRRT.

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Table 1. Key medications requiring dose adjustment or cessation in AKI

<p>Analgesics(morphine, meperidine, gabapentin, pregabalin)</p> <p>Antiepileptics(Lamotrigine)</p> <p>Antivirals(Acyclovir, ganciclovir, valgancyclovir)</p> <p>Antifungals(Fluconazole)</p> <p>Antimicrobials(Almost all antimicrobials need dose adjustment in AKI, with notable exceptions of azithromycin, linezolid, moxifloxacin, doxycycline, nafcillin, rifampin)</p> <p>Diabetic agents(Sulphonylureas and Metformin)</p> <p>Allopurinol</p> <p>Baclofen</p> <p>Colchicine</p> <p>Digoxin</p> <p>Lithium</p> <p>Low molecular weight heparin</p> <p>Novel oral anticoagulants</p>
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3.4 Management of COVID-19 patients who are hemodynamically stable and without Acute lung injury(ALI)/Acute respiratory distress syndrome (ARDS)

a. Fluid challenge & furosemide stress test

- All hemodynamically stable patients without ALI/ARDS and volume overload should receive a fluid & furosemide challenge unless contraindicated. The steps of the analysis are as follows.
- Assess the volume status: Look for skin turgor, capillary refill time, peripheral edema, chest crepitation, and postural hypotension.

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- If there is no evidence of volume overload, give 20 -30 ml /KBW of Crystalloid over 2-3 hours with careful monitoring for volume overload
- Give furosemide bolus (1 mg/KBW for furosemide naïve patents & 1.5 mg/KBW for patients who received furosemide)
- Monitor urine output for 2 hours. If >200 ml of urine is produced over the next two hours, short-term renal recovery is likely. If <200 ml urine is produced, this predicts ongoing renal dysfunction which may require dialysis

b. Renal replacement therapy:

Indications:

- There is no consensus on the indications for the initiation of RRT in COVID -19 patients.
- The standard indications include oliguria, volume overload, metabolic acidosis ($P^H < 7.2$), and hyperkalemia (Potassium > 5.5 meq/L).
- Consider a broader clinical context, the presence of conditions that can be modified with RRT and trends of laboratory tests- rather than single BUN and creatinine threshold alone.
- A volume unresponsive patient with any stage of AKI is considered as a potential candidate for RRT

Modality of RRT:

All hemodynamically stable patients without acute lung injury (ALI), with indications for RRT, would either receive hemodialysis (HD) or acute peritoneal dialysis (APD). HD should be given on alternate days till the kidney shows signs of recovery. APD would consist of 2 L hourly exchanges with a dextrose based solution. The APD duration should be limited to 72 hours if a stiff catheter is used.

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Vascular access for hemodialysis:

The following preferences may be considered:

First choice: right jugular vein

Second choice: femoral vein; avoid femoral catheterization on the side of transplant kidney in renal transplant recipients.

Third choice: left jugular vein

Fourth choice: subclavian vein with a preference for the dominant side

Anticoagulation:

Standard heparin (unfractionated) shall be given unless there is a contraindication.

Termination of dialysis: The decision to stop dialysis will be taken on a case to case basis, depending on urine output, serum potassium, volume status, acidosis, and general medical condition.

3.5 Management of COVID-19 patients who are hemodynamically unstable and have ALI/ARDS

a. Fluid challenge

- In quiet breathing as well as mechanically ventilated patients, the volume responsiveness should be measured by a mini fluid challenge or passive leg raising test with real-time cardiac output monitoring. The procedure is described as follows

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Mini fluid challenge

- 200-250 cc of crystalloid /isotonic albumin is infused over 5-10 minutes
- A 10-15 % **increase** in stroke volume or > 15% increase in the cardiac index means a volume responsive component is present.

Passive leg raising test

- Explain the procedure in conscious patients; avoid touching patients throughout the process.
 - Keep head end elevated at 45 degree
 - lower patient's upper body to horizontal and **passively raise legs** at 45 degrees up, using the bed attachment
 - Observe for 30-90 seconds; a 10% **increase** in stroke volume means a volume responsive component is present.
- Volume responsive patients will be given fluids. Volume unresponsive patients will be potential candidates for renal replacement therapy.

b. Renal replacement therapy:

Indications:

- There is no consensus on the indications for the initiation of RRT in COVID -19 patients.
- The standard indications include oliguria, volume overload, metabolic acidosis ($P^H < 7.2$), and hyperkalemia (Potassium > 5.5 meq/L).
- Consider a broader clinical context, the presence of conditions that can be modified with RRT and trends of laboratory tests- rather than single BUN and creatinine threshold alone.
- A volume unresponsive patient with any stage of AKI is considered as a potential candidate for RRT

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Modality of RRT:

- Continuous renal replacement therapy (CRRT) or Sustained low efficacy dialysis (SLED) will be given depending on the clinical conditions as well as the availability of human resources for CRRT.
- SLED will be given on an alternate day / daily basis for 6-8 hours.
- Since CRRT is labor intensive, it will be reserved for patients with severe lung injury and hemodynamic compromise, as identified by the multidisciplinary team.
- For CRRT, the default mode will be CVV-HF with 35 ml /KBW of replacement fluid; the ultrafiltration should be limited to 1.5 mg/KBW/day.
- The pump speeds should be decided on a case to case basis. If the small solute clearance is inadequate, the therapy would be shifted to CVV-HDF.
- The daily fluid intake should be adjusted in consultation with the multidisciplinary team to ensure a zero/minimally positive net fluid balance. Positive net fluid balances more than 10% of body weight should be avoided.
- The blood sugars and electrolytes (sodium, potassium, calcium, magnesium, and phosphorus) should be monitored 6-8 hourly for CRRT and daily for SLED.

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First choice: right jugular vein

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Third choice: left jugular vein

Fourth choice: subclavian vein with a preference for the dominant side

Anticoagulation:

The decision to give heparin would be based on coagulation profile and bleeding risk.

Termination of dialysis: The decision to stop dialysis will be taken on a case to case basis, depending on urine output, serum potassium, volume status, acidosis, and general medical condition.

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4. MANAGEMENT OF MAINTENANCE HEMODIALYSIS PATIENTS WITH COVID-19

4.1 Patients with upper respiratory symptoms /fever (suspected COVID 19) on Maintenance Hemodialysis:

All End-stage renal disease (ESRD) patients on regular maintenance Hemodialysis (MHD) with suggestive symptoms (fever, dry cough, breathlessness) should be tested as per ICMR guidelines.

4.1.1 All dialysis patients mandatorily visit a dialysis unit or hospital twice or thrice a week for the life-saving treatment. It is hence not possible for dialysis patients to practice total home quarantine, as is recommended for most individuals. Furthermore, many of these patients carry additional risk factors like diabetes, hypertension, CKD itself, and ACE inhibitor therapy and are likely to develop more severe disease. The logistics of isolating all is unproven, but highly suspicious cases may place a severe strain on the resources of dialysis. (8)

4.1.2 Specific instructions are given to patients having fever or upper respiratory symptoms while undergoing MHD:

- Covering mouth and nose with a disposable tissue (The unit may provide these) when coughing or sneezing or using the inside of the elbow. This may be displayed in pictures that are available from the CDC website <https://www.cdc.gov/coronavirus/2019-ncov/healthcare-facilities/dialysis.html>.
- Throw used tissues in the trash. The unit should ensure the availability of plastic-lined trash cans appropriately labeled for disposing of used

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tissues. The trash cans should be foot-operated ideally to prevent hand contact with infective material.

- Immediately wash hands (6 step hand wash) with soap and water for at least 40 seconds. Pictorial instructions on various steps of hand wash will be demonstrated near the wash area.
- If soap and water are not readily available, clean your hands with a hand sanitizer that contains at least 60% alcohol (20 seconds).
- Wear a facemask when around other people (e.g., sharing a room or vehicle) and before entering a healthcare provider's office.
- If unable to wear a facemask (for example, because it causes trouble breathing), then cover coughs and sneezes as above. Dialysis personnel, attendants, and caregivers should wear a facemask if they enter the room of such patients.
- All patients who are coughing or sneezing should be encouraged to wear a face mask.

4.2 Primary contacts of COVID 19 Patients / MHD patients hospitalized with interstitial pneumonia awaiting COVID 19 test

- Primary contacts of COVID-19 patients and patients on regular hemodialysis, hospitalized with interstitial pneumonia awaiting the COVID -19 test shall be offered dialysis in an isolation facility in the Outpatient Hemodialysis Centre after regular dialysis shifts are over.
- The staff taking care of such patients shall be provided full PPE

4.3 COVID – 19 positive patients on Maintenance Hemodialysis:

- All patients with a positive test for COVID 19 will be dialyzed in the dedicated COVID-19 facility.
- Such dedicated areas should have disposable tissues and waste disposal bins placed next to each dialysis chair/bed and nursing stations to ensure adherence to hand and respiratory hygiene and cough etiquette.

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- Each dialysis chair/bed should be equipped with an appropriate alcohol-based hand sanitizer within reach of patients and staff.
- Appropriate personal protective equipment for dialysis doctors and nurses looking after proven or strongly suspected patients of COVID 19: This will be done as per existing JIPMER infection control practices (Infection prevention & control, Hospital Infection Control Committee, JIPMER, Version 1, 24.03.2020)
- Sleeved plastic aprons can be used in addition to, and not as a replacement for PPE recommended above.
- Dedicated dialysis nurses will be available, who do not look after other patients during the same shift.
- Clean and disinfect frequently touched surfaces at least thrice daily and after every shift. This includes bedside tables and lockers, dialysis machines, doorknobs, light switches, countertops, handles, desks, phones, keyboards, toilets, faucets, and sinks
- All machines will be disinfected after each dialysis session; a hot water rinse followed by chemical disinfection with 1% bleach.
- Bed linen will be changed after each dialysis session. The linen will be disinfected as per standard infection control protocols outlined by JIPMER (Infection prevention & control, Hospital Infection Control Committee, JIPMER, Version 1, 24.03.2020).

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5. MANAGEMENT OF PERITONEAL DIALYSIS PATIENTS WITH COVID-19:

- ESRD patients on CAPD are advised to stay at home. Hospital visits should be minimized for emergencies. Consultations should otherwise be conducted by telehealth(9).
- Non-essential procedures eg. PET, clearance measurement should be avoided during the pandemic to minimize unnecessary patient contact.
- Patients should have at least 2 weeks PD supplies and sufficient medications in case they have to self-isolate, or there is a break in the supply chain (eg due to delivery staff sickness)(9).
- The decision to hospitalize CAPD patient's with COVID are subject to the prevailing hospital /national policies on hospitalization.
- Patients on CAPD who require hospitalization for COVID-19 shall be admitted in the COVID-19 ward.
- If the patient is unable to perform PD exchanges due to severity of disease, exchanges shall be performed by a trained nurse or a dialysis technician. If trained staff is not available, the patient shall be transferred to an extracorporeal treatment modality like HD/SLED/CRRT, depending on the clinical status.
- Effluent fluid after dwell time (PD exchange) should be treated like other body fluids and disposed of in the toilet. A cupful of 0.5% bleach should be poured into the toilet and the bag drained into this. The toilet should be flushed only after 5 minutes. On emptying PD effluent into the toilet, the eyes and face of the patient/care giver / healthcare worker should be protected (splash protection). Used PD bags and tubing should be placed in a plastic bag with a small amount 0.5% bleach, the bag sealed, then placed in another plastic bag (double-bagging), before being discarded with biomedical waste (or regular garbage disposal, if at home). Any

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inadvertent spills or splashes on surfaces should be disinfected with 1:10 dilution household bleach.

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6. KIDNEY TRANSPLANT PROGRAM:

- Living & Deceased donor transplantation program shall remain suspended till further notice
- Patients with stable graft function and adequate drug supply can avoid routine follow up visits to the hospital
- Need for transplant recipients to visit the hospital shall be minimized by offering telephonic consultation as well as with the assistance of digital telehealth platforms
- Transplant recipient should follow all the precautions recommended for the general public

6.1 Kidney transplant recipient with COVID – 19

There are two issues of management of organ transplant patients with COVID-19.

a. Management of COVID-19 in a transplant recipient.

There is a scarcity of data and consensus on effective treatments of COVID-19 in Transplant patients. Few centers have tried antivirals, hydroxychloroquine, and Macrolides in COVID-19 patients with variable results. However, as of now, there is no treatment approved by the Central Drugs Standard Control Organization (CDSCO) or the Foods and Drug Administration (FDA) for COVID-19(10).

b. Management of organ transplant medicines with COVID-19

There is no consensus regarding modification in the immunosuppressive regimen of Transplant recipients with COVID-19. The dose adjustment has to balance the infection control and organ rejection. However, there is an overall agreement of stopping antimetabolite drugs and decrease calcineurin inhibitors by 50%. The steroid should be continued on the

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same doses. (Massachusetts General Hospital COVID-19 Treatment Guidance)

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7. REFERENCES

1. Naicker S, Yang C-W, Hwang S-J, Liu B-C, Chen J-H, Jha V. The Novel Coronavirus 2019 epidemic and kidneys. *Kidney Int* [Internet]. 2020 Mar 7 [cited 2020 Mar 31];0(0). Available from: [https://www.kidney-international.org/article/S0085-2538\(20\)30251-9/abstract](https://www.kidney-international.org/article/S0085-2538(20)30251-9/abstract)
2. Cheng Y, Luo R, Wang K, Zhang M, Wang Z, Dong L, et al. Kidney disease is associated with in-hospital death of patients with COVID-19. *Kidney Int* [Internet]. 2020 Mar 20 [cited 2020 Mar 31]; Available from: <http://www.sciencedirect.com/science/article/pii/S0085253820302556>
3. Guan W, Ni Z, Hu Y, Liang W, Ou C, He J, et al. Clinical Characteristics of Coronavirus Disease 2019 in China. *N Engl J Med* [Internet]. 2020 Feb 28 [cited 2020 Mar 31]; Available from: <https://www.nejm.org/doi/10.1056/NEJMoa2002032>
4. Huang C, Wang Y, Li X, Ren L, Zhao J, Hu Y, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *The Lancet*. 2020 Feb 15;395(10223):497–506.
5. Wang D, Hu B, Hu C, Zhu F, Liu X, Zhang J, et al. Clinical Characteristics of 138 Hospitalized Patients With 2019 Novel Coronavirus–Infected Pneumonia in Wuhan, China. *JAMA*. 2020 Mar 17;323(11):1061–9.
6. Chen N, Zhou M, Dong X, Qu J, Gong F, Han Y, et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. *The Lancet*. 2020 Feb 15;395(10223):507–13.
7. Khwaja A. KDIGO clinical practice guidelines for acute kidney injury. *Nephron Clin Pract*. 2012;120(4):c179-184.
8. Narayan Prasad. Guidelines and position statements for COVID-19 ; Indian Society of Nephrology COVID-19 working group. 2020.
9. Jeff Perl EB. ISPD: Strategies regarding COVID-19 in PD patients. 2020.

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10. Sanjay Kumar Agarwal VK. Indian society of Organ transplantation(ISOT) transplant specific guidelines during COVID-19 outbreak. 2020.

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