

## Consensus and Guide to New Corona Virus Infections

Fast track

Shanghai 2019 comprehensive treatment of coronavirus disease expert consensus

Expert Group on Clinical Treatment of New Corona Virus Disease in Shanghai

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### Summary

With the in-depth understanding of 2019 coronavirus disease (corona virus disease 2019, COVID-19), the Shanghai New Corona Virus Disease Clinical Treatment Expert Group followed the national new coronavirus pneumonia diagnosis and treatment plan, and continuously optimized and refined the treatment plan on the basis of fully absorbing the experience of domestic and foreign counterparts, and formed an expert consensus opinion from the three aspects of pathogen and epidemiological characteristics, clinical characteristics and diagnosis, and treatment plan.

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Coronavirus disease 2019 (COVID-19) was first reported in Wuhan, Hubei Province, on 31 December 2019. COVID-19 as a respiratory infectious disease, has been included in the "People's Republic of China Infectious Disease Prevention and Control Law" provisions of class B infectious diseases, according to class A infectious diseases management.

With the deepening of understanding of disease, all over the country in COVID-19 prevention and treatment have accumulated some experience. Shanghai new coronavirus disease clinical treatment expert group follow the national new coronavirus pneumonia diagnosis and treatment program, fully absorb the experience of domestic and foreign counterparts, in order to improve the success rate of clinical treatment and reduce the patient mortality rate of the goal, to prevent the progress of the disease, gradually reduce the proportion of seriously ill patients, improve its clinical prognosis. On the basis of continuous optimization and refinement of treatment plan, expert consensus opinions have been formed on the relevant clinical diagnosis and treatment work.

### Pathogens and epidemiological characteristics

2019 New Coronavirus (2019 novel coronavirus, 2019-nCoV) is a new type of coronavirus belonging to beta. On 11 February 2020, the International Committee on Virus Classification (The International Committee on Taxonomy of Viruses, ICTV) named the virus Severe Acute Respiratory Syndrome (Acute Respiratory Syndrome 2) Rety syndrome coronavirus 2, SARS-CoV-2. CoVID-19 patients and

asymptomatic infections can spread 2019-nCoV. The transmission by respiratory droplets is the main route of transmission and can also be transmitted through contact. There is also a risk of aerosol propagation in confined spaces. 2019-nCoV can be detected in the feces, urine and blood of COVID-19 patients, and some patients can still be tested positive for fecal nucleic acid after negative testing for pathogen nucleic acid in respiratory samples. Crowds are generally susceptible. Children and infants also have the disease, but the disease is mild.

## Clinical characteristics and diagnosis

### (i) Clinical characteristics

The incubation period is 1 to 14 d, mostly 3 to 7 d, with an average of 6.4 d. To fever, fatigue, dry cough as the main performance. Can be accompanied by runny nose, sore throat, chest tightness, vomiting and diarrhea and other symptoms. Some patients had mild symptoms, and a few had no symptoms or pneumonia.

The elderly and those with diabetes, hypertension, coronary atherosclerosis heart disease, extreme obesity and other underlying diseases are prone to develop into severe illness after infection. Some patients develop symptoms such as breathing difficulties 1 week after onset of the disease, and severe cases can progress to acute respiratory distress syndrome (acute respiratory distress syndrome, ARDS) and multi-organ functional impairment. The time to progress to critical illness is approximately 8.5 d. It is worth noting that heavy, critical patients can have low to medium heat in the course of the disease, or even no obvious fever. Most patients have a good prognosis, with deaths mostly in the elderly and those with chronic underlying diseases.

Early CT examination is characterized by multiple small patches or grinding glass shadows, the inner texture can be meshed strip-shaped thick shadow, with the lung band obvious. A few days later the lesions increased, the scope expanded, a wide range of double lung, multiple grinding glass shadow or immersion lesions, part of the lung real change, often bronchial inflatable signs, chest fluid is rare. A small number of patients progressed rapidly, with the change in imaging reaching a peak in the 7th to 10th day of the course. Typical "white lung" performance is rare. After entering the recovery period, the lesions are reduced, the scope is reduced, the oozing lesions are absorbed, some of the fibrous slats appear, and some patients can be completely absorbed.

The total number of peripheral white blood cells in patients with early onset was normal or decreased, the lymphocyte count decreased, some patients could have abnormal liver function, lactic acid dehydrogenase, myosin and myoglobin levels increased; In most patients, CRP and ESR levels were elevated and calcium-lowering levels were normal. In severe cases, d-dimer levels increased, other blood clotting indicators abnormal, lactic acid levels increased, peripheral blood lymphocytes and CD4-T lymphocytes for sexual reduction, as well as electrolyte disorders, acid-base imbalance, etc., to metabolic alkali poisoning is more common. Elevated levels of inflammatory cytokines (e.g. IL-6, IL-8, etc.) can occur during the progression of the disease.

### (ii) Diagnostic criteria

#### 1. Suspected cases:

Combined with the following comprehensive analysis of epidemiological history and clinical manifestations. Any one of the epidemiological history that meets any 2 of clinical manifestations, or 3 of which have no clear epidemiological history but are consistent with clinical manifestations, are diagnosed as suspected cases. (1) Epidemiological history: 14 d before the onset of the disease in Wuhan City and surrounding areas, or other case-reported community travel history or residence history; (2) Clinical manifestations: fever and/or respiratory symptoms; with the above-mentioned new coronavirus pneumonia imaging characteristics; the total number of white blood cells in the early stages of the disease is normal or decreased, and lymphocytes count decreased.

## 2. Confirmed cases:

A person with one of the following pathogenic evidence is diagnosed as a confirmed case. (1) Real-time fluorescent reverse transcription PCR test 2019-nCoV nucleic acid positive. (2) Viral gene sequencing found homologous with known 2019-nCoV height. (3) In addition to nasopharyngeal swabs, it is recommended to leave sputum as far as possible, the implementation of tracheal intubation patients can collect lower respiratory secretions sent to viral nucleic acid detection.

### (iii) Differential diagnosis

Mainly with influenza virus, para-flu virus, adenovirus, respiratory syncytial virus, rhinovirus, human lung virus, severe acute respiratory syndrome (severe acute respiratory syndrome, SARS) coronavirus and other known viral pneumonia identification, with pneumonia mycoplasma, chlamydia pneumonia and bacterial pneumonia identification. In addition, it is necessary to identify with non-infectious diseases, such as vasculitis, dermatitis and other connective tissue diseases caused by pulmonary lesions and metastasis.

### (4) Clinical type

#### 1. Light:

Clinical symptoms were mild, and imaging examination did not show pneumonia.

#### 2. Normal:

With fever, respiratory tract and other symptoms, imaging examination can be seen pneumonia performance.

Early warning of severe illness in common patients should be strengthened. Based on the current clinical research, the elderly (age 65 years old), accompanied by basic diseases, CD4-T lymphocytes 250 / sl, blood IL-6 levels significantly increased, 2 to 3 d pulmonary imaging examination found significant progress of lesions, lactic dehydrogenase (lactic dehydrogenase, LDH), 2 times the normal value limit, lactic acid 3 mmol/

#### 3. Heavy:

Conforms to any of the following. (1) Air shortness, breathing frequency of 30 times/min; (2) in a resting state, refers to arterial oxygen saturation (arterial oxygen saturation, SaO<sub>2</sub>) <93%; (3) arterial blood oxygen fraction pressure (arterial partial pressure, PaO<sub>2</sub>) / oxygen absorption concentration (fraction of the oxygen, FiO<sub>2</sub>) <300 mmHg Hg (1 mmHg.33). High altitude (over 1,000 m) areas should be corrected for PaO<sub>2</sub>/FiO<sub>2</sub> in accordance with the following formula: PaO<sub>2</sub>/FiO<sub>2</sub> x (mmHg)/760).

Lung imaging examination showed that 24 to 48 h internal lesions significantly progress . . . 50% of the people were managed by heavy duty.

#### 4. Critical type:

Those who meet any of the following can be judged to be critical. (1) respiratory failure, and requires mechanical ventilation; (2) shock; (3) combined with other organ failure, requires ICU monitoring treatment.

##### (v) Clinical monitoring

Dynamic monitoring of patients' clinical performance, vital signs, fluid inbalance, gastrointestinal function and mental state are monitored daily.

Dynamic monitoring of oxygen saturation of the end of the blood in all patients is monitored. For patients with severe and critical conditions, blood gas analysis was carried out in a timely manner according to changes in the condition; blood routine, electrolyte, CRP, calcite, LDH, clotting function indicators, blood lactic acid, etc., at least 1 test per 2 d; liver function, renal function, ESR, IL-6, IL-8, lymphocyte subgroup, at least 1 test per 3 d; chest imaging examination, usually 1 test per 2 d. For ARDS patients, a routine ultrasound of the heart and lungs next to the bed is recommended to observe the parameters of the extravascular pulmonary water and heart. In vitro membrane pulmonary oxygenation (extracorporeal membrane oxygenation, ECMO) patient monitoring refers to the implementation section of ECMO.

#### Treatment

##### (i) Antiviral therapy

Can be tried hydroxychloroquine or chlorpyrifos phosphate oral, abidore oral, interferon atomized inhalation, preferred interferon. It is not recommended to use 3 or more antiviral drugs at the same time. The virus nucleic acid should be deactivated in time after the virus nucleic acid has turned negative. The efficacy of all antiviral drugs has yet to be evaluated in further clinical studies.

For patients with positive nucleic acid for heavy and critical viral nucleic acids, the recovery stage plasma may be trialled. Detailed operation and management of adverse reactions refer to the National Health And Health Commission issued by the National Health Commission of the "new Corona pneumonia rehabilitation plasma clinical treatment plan" (trial first edition) . Infusion within 14 d may be more effective, in the later stages of the course, if the continuous detection of viral nucleic acids, can also be trialled in the recovery period plasma treatment.

##### (ii) Treatment of light and general patients

Support treatment needs to be strengthened to ensure adequate heat, attention to water, electrolyte balance, maintain internal environmental stability, close monitoring of patients' vital signs and oxygen saturation. Timely and effective oxygen therapy measures. Antibacterial drugs and glucocorticoids are not used in principle. Patients need to be closely monitored, and if there is a significant progression and a risk of becoming serious, comprehensive measures are recommended to prevent the disease from progressing to a heavy level, with caution as appropriate (see the application section of glucocorticoids). Heparin anticoagulant and high-dose vitamin C treatment is recommended. Low-molecular heparin 1 to

2 /d, continued until the patient's D-dimer level returned to normal. Once the fibrin degradation product (fibrin degradation product, FDP) is 10 µg/mL and/or D-dimer is 5 µg/mL, use ordinary heparin anticoagulant. Vitamin C 50 to 100 mg/kg per day, intravenous drips, continuous use time to oxygenation index significantly improved as the goal. If there is progress in lung lesions, it is recommended to apply high-dose broad-spectrum protease inhibitors of 60 to 1 million units/d, continuing to improve the imaging examination of the lungs. Intermittent short-term blood filtration (intermittent short veno-venous hemofiltration, ISVVH) is recommended in the event of a cytokine storm.

(iii) The function of organs in critically ill patients supports treatment

#### 1. Protection and maintenance of the cycle function:

The principle of early active control rehydration is implemented. It is recommended to assess effective capacity and initiate fluid therapy as soon as possible after admission. Heavy-duty patients can choose intravenous pathways or through colon pathways for fluid resuscitation. The supplementary liquid is preferred lactic acid ringer. For vascular active drugs, norepinephrine combined with dopamine is recommended to maintain vascular tension and increase heart displacement. For patients with shock, norepinephrine is preferred, and it is recommended to start using small doses of vascularly active drugs at the same time as fluid resuscitation to maintain circulatory stability and avoid excessive fluid infusion. Heavy, critically critical patients are recommended to use heart-protecting drugs and to avoid sedatives that inhibit the heart. Isopropyl epinephrine can be used in patients with sinus tachycardia. It is recommended that for patients with sinus heart rhythm, heart rate of 50 times/min and hemodynamic instability, intravenous pumping of small doses of isopropyl epinephrine or dopamine to maintain heart rate at about 80 times/min.

#### 2. Reduce inflammation of the pulmonary ito:

2019-nCoV causes severe pulmonary interstitial lesions that can cause lung function deterioration, and high-dose broad-spectrum protease inhibitors are recommended.

#### 3. Protection of kidney function:

Early and reasonable anticoagulant therapy and appropriate liquid therapy are recommended. See the section on the prevention and treatment of cytokine storms, the protection and maintenance of cycling functions.

#### 4. Protection of intestinal function:

Bionics can be used to improve the intestinal microecology of patients. Use raw yellow (15 to 20 g plus 150 ml of warm boiling blisters) or large gas soup or enemas.

#### 5. Nutritional support:

Preferred gastrointestinal nutrition, through nasal feeding or through the empty intestine. The preferred whole protein nutrition preparation is 25 to 35 kcal/kg per day (1 kcal x 4.184 kJ).

#### 6. Prevention and control of cytokine storms:

High doses of vitamin C and ordinary heparin anticoagulant are recommended. High doses of vitamin C are intravenously injected 100 to 200 mg/kg per day. Continuous use time is aimed at a significant improvement in oxygenation index. It is recommended to apply high-dose broad-spectrum protease inhibitors, given 1.6 million units per 8 h 1 time, in a mechanical ventilation state, when the oxygenation index of 300 mmHg can be reduced to 1 million units/d. Anticoagulant therapy can be used to protect endothelial cells and reduce cytokine release, FDP s 10 sg/mL and/or D-diipolymers s5 sg/mL to ordinary heparin (3 to 15 IU/kg per hour) anticoagulant. The patient's clotting function and platelets must be reviewed at 4 h after first use of heparin. With ISVVH, 6 to 10 h per day.

#### 7. Sedative muscle looseness and artificial hibernation therapy:

Patients with mechanical ventilation or receiving ECMO need to be sedated on an algemotheic basis. For patients with severe human-machine resistance when establishing artificial airways, it is recommended to apply small doses of muscle loose medicine for short-range use. Hibernation therapy is recommended for patients with oxygenation index of 200 mmHg. Artificial hibernating therapy can reduce the body's metabolism and oxygen consumption, while expanding blood vessels in the lungs and significantly improve oxygenation, it is recommended to use continuous intravenous injection of the method of medication, the patient's blood pressure needs to be closely monitored. Be careful with opioids and right metamida. Due to the presence of severe patients with abnormal LEVELs of IL-6 and easy to lead to bloating, should avoid the use of opioids, and 2019-nCoV can inhibit the function of sinus and the occurrence of sinus tachycardia, so should be careful lying with the heart inhibited sedatives. In order to prevent the occurrence and aggravation of lung infection, try to avoid excessive sedation for a long time, the condition should be allowed to withdraw the muscle loose medicine as soon as possible. It is recommended to closely monitor the depth of sedation.

#### 8. Oxygen therapy and breathing support:

(1) nasal catheter or mask oxygen therapy, restand air conditions SaO<sub>2</sub> , or after the activity SaO<sub>2</sub> 90%, or oxygenation index (PaO<sub>2</sub>/FiO<sub>2</sub>) for 200 to 300 mm Hg; accompanied or not accompanied by respiratory distress; (2) by nasal high-flow oxygen therapy (high-flow nasal cannula oxygen therapy, HFNC), receiving nasal catheter or mask oxygenation 1 to 2 h oxygenation does not meet the treatment requirements, breathing distress does not improve; (3) Non-invasive positive pressure ventilation (non-invasive positive ventilation, NPPV), receiving HFNC 1 to 2 h oxygenation is not effective at treatment, no improvement in respiratory distress; or in the course of treatment hypoxemia and/or respiratory distress increased; or oxygenation index of 150 to 200 mmHg; (4) When there is invasive mechanical ventilation, receiving HFNC or NPPV treatment 1 to 2 h oxygenated does not meet the treatment requirements, breathing distress does not improve, or in the course of treatment hypoxemia and/or respiratory distress aggravated, or oxygenation index 150 mm Hg, should be considered for invasive ventilation. A protective ventilation strategy with low tide air volume (4 to 8 mL/kg ideal mass) as the core is preferred.

#### 9. Implementation of ECMO:

An ECMO may be considered if one of the following conditions is met. (1) PaO<sub>2</sub>/FiO<sub>2</sub> 50 mmHg exceeds 1 h; (2) PaO<sub>2</sub>/FiO<sub>2</sub> 80 mmHg exceeds 2 h; (3) arterial blood pH of 7.25 and accompanied by PaCO<sub>2</sub> 60 mmHg more than 6 h. THE ECMO MODE PREFERRED INTRAVENOUS-VENVEAL ECMO.

#### (4) Special problems in treatment and treatment

##### 1. Application of glucocorticoids:

Caution should be used with glucocorticoids. Imaging examination suggests that there is significant progress in pneumonia, resting in the state of non-oxygen patients SaO<sub>2</sub> , 93% or shortness of breath (breathing frequency of 30 times / min) or oxygenation index of 300 mmHg, especially the progress of the disease significantly accelerated, in the face of intubation risk can be added to the glucocorticoid. Patients are advised to withdraw their use of glucocorticoids quickly when intubation or ECMO support can maintain effective blood oxygen concentrations. For non-severe patients using metastasis nylon, the recommended dose is controlled at 20 to 40 mg/d, severe patients control at 40 to 80 mg/d, the course of treatment is generally 3 to 6 d. Depending on the body mass discretion, the amount of increase or decrease.

##### 2. Use of immunomodulating drugs:

Injection of thymus peptides twice a week has some effect on improving the immune function of patients, preventing severe illness and shortening the detox time. Due to the lack of specific antibodies, the use of intravenous human immunoglobulin therapy in large doses is not currently supported. However, some patients have low lymphocyte levels and are at risk of combining other viral infections, and can infuse human immunoglobulin 10 g/d intravenously, with a course of 3 to 5 d.

##### 3. Precise diagnosis and treatment of combined bacterial and fungal infections:

Clinical microbiological monitoring of all critically ill and critically ill patients. Every day to take the patient's sputum and urine for culture, high fever patients in a timely blood culture. All suspected sepsis patients with an vascular catheter should be sent to the peripheral peripheral venous blood culture and catheter blood culture at the same time. All suspected sepsis patients may consider collecting peripheral blood for germological molecular diagnostic examination, including PCR-based molecular biology testing and second-generation sequencing.

Elevated levels of calcitonin were indicative for the diagnosis of sepsis/sepsis shock. When the condition of the new coronavirus pneumonia worsens, there is an increase in THE level of CRP, and the increase of CRP level is not specific to the diagnosis of sepsis caused by bacterial and fungal infections.

Critically ill patients with open airways tend to be prone to bacterial and fungal infections later in life. If sepsis occurs, empirical anti-infection treatment should be given as soon as possible. For patients with septic shock, empirical antimicrobials can be combined before obtaining a pathogen diagnosis, while covering the most common e. coli, staphylococcal and enterococci infections. Infected persons who occur after hospitalization may be able to use beta-lactamase inhibitor complexes. If the treatment effect is not good, or the patient is severe infectious shock, can be replaced with carbon penicillin drug treatment. If you consider the combination of enterococci and staphylococcus infection, can be added to the glycopeptide drug (vancomycin) for empirical treatment, blood flow infection optional dattomycin, lung infection-based can be selected linazine. Attention should be paid to catheter-related infections in critically ill patients, and the treatment should be empirically covered with staphylococcus staphylococcus resistant to methicillin. Empirical treatment with glycopeptide drugs (vancomycin) is optional. Candida infection is also more common in critically ill patients, if necessary, experience coverage candidatreatment, can be added to the drug echiconobacteria. As the length of hospital stay

for seriously ill patients increases, drug-resistant infections are gradually increasing, and the use of antimicrobial drugs must be adjusted according to drug-sensitive tests.

#### 4. Hospital infection prevention and control:

(1) According to the 2019 National Health and Health Commission "Basic System for Infection Prevention and Control of Medical Institutions (Trial)" (13), actively implement evidence-based infection prevention and control cluster intervention strategy, effective prevention of ventilator-related pneumonia, intravascular catheter-related blood flow infection, catheter-related urinary tract infection, carbon penicillin drug-resistant gram-negative bacillus and other multi-drug-resistant bacteria and fungal infections. (2) Strictly comply with the requirements of the National Health and Health Commission's Technical Guide for the Prevention and Control of New Corona Virus Infections in Medical Institutions (First Edition) "Guidelines on the Use of Common Medical Protection Supplies in The Prevention and Control of New Corona Virus Infections (Trial)" "Technical Guidelines for the Protection of Medical Personnel during the Outbreak of New Corona Pneumonia (Trial)" 5,16), strengthen the process management, the correct selection and use of masks, isolation clothing, protective clothing, eye masks, protective masks, gloves and other personal protective supplies, strict implementation of disinfection and isolation measures, to minimize the risk of hospital infection, to eliminate medical personnel in the hospital 2019-nCoV infection.

#### 5. Treatment of infants and young children:

Light children only need oral administration. In addition to oral administration of the disease in ordinary children, dialectical Chinese medicine treatment may be considered. If a bacterial infection is combined, an antibacterial drug can be added. Critically ill children are mainly supported by the treatment of the disease, the experience of the ribavirin injection antiviral treatment, 15 mg/kg (2 times/d), the course of treatment does not exceed 5 d.

#### (5) The combination of Chinese and Western medicine treatment schemes

The combination of Chinese and Western medicine to treat the new coronavirus pneumonia can improve the synergistic effect. For adult patients, the condition can be improved by dialectical treatment of Chinese medicine. For light patients, the certificate is that the person who is a wind-hot witness gives the Chinese medicine silver warp plus subtraction treatment, mainly gastrointestinal symptoms, the proof is wet to stop Weiyang to give the pupu xia soup, three ren Tonga minus. For ordinary patients, the certificate is hot evil lung, to give Chinese medicine hemp apricot gantonga reduction; For heavy patients, if the fever does not retreat, even high fever, bloating, feces dry closed knot, the evidence is a hot poison closed lung, to give Chinese medicine large gas soup enema to pass through the diarrhea fever, so that the fever is reduced or heat back, can also be used Chinese medicine white tiger soup, lifting and dispersing and xuan white gas Tonga reduction treatment, so as to cut off the disease, reduce the occurrence of heavy to critical type. Children light patients, the evidence of the time-borne disease guard, can be used silver warp or incense sanois plus and minus. Ordinary type of children, wet hot closed lung, to give the apricot soup three ren Tonga reduction; Heavy patients if the epidemic poison closed lungs (currently rare in the country) can refer to adult Xuan Bai gas soup with ganlu disinfection Tonga minus;

#### (6) Discharge criteria



At the same time, those who meet the following conditions may be considered for discharge: (1) the normal body temperature of 3 d; (2) the apparent improvement of respiratory symptoms; (3) lung imaging examination showed a significant improvement in acute oxudicity lesions; (4) two consecutive respiratory specimen nucleic acid test negative (at least 1 d );(5) respiratory sample nucleic acid test negative, fecal pathogen nucleic acid test negative; (6) the total course of disease more than 2 weeks.

#### (7) Health management of discharged patients

1. For discharged patients, close follow-up should still be made. Follow-up is recommended in the 2nd and 4th weeks after the patient is discharged from the hospital to the designated follow-up clinic.
2. When a patient is discharged from the hospital, he or she should be clear about his/her place of residence and address in the city.
3. Patients stay at home for 2 weeks after discharge from hospital, avoid activities in public places, must wear a mask when they go out.
4. According to the patient's address (including hotels or hotels), the relevant district health and health committee organized by the corresponding medical institutions to do a good job of health management. For 2 weeks, professionals will be able to measure a patient's temperature twice a day, ask about their health status, and conduct health education.
5. If fever and/or respiratory symptoms occur again, the corresponding medical institution shall promptly report to the District Health and Health Commission, District Centers for Disease Control and Prevention, and assist in sending the designated medical institutions within the jurisdiction for medical treatment.
6. District Health Committee, District Centerfor for Disease Control and Prevention received the report, timely report to the higher authorities.

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Conflict of interest

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