



## Views on Discharge Criteria and Stratified Management of Admission for COVID-19: A Case Report

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### Abstract

We report a case of atypical clinical manifestation of pneumonia infected by 2019-novel coronavirus, which is helpful to improve the understanding of the clinical characteristics of pneumonia caused by the virus. At the same time, some suggestions on the discharge criteria and hierarchical management of admission of 2019-nCoV pneumonia are put forward. The results are constructive for effective prevention and control of 2019-nCoV pneumonia and optimizing patient process management in China.

**Keywords:** COVID-19; Management; Discharge criteria

### Introduction

In Dec, 2019, a series of pneumonia cases caused by 2019-novel coronavirus (2019-nCoV) has broken out in Wuhan, Hubei, China. Because of its obvious characteristics of human-to-human transmission infection, the epidemic spread in the middle part area of China around Wuhan and also spread to many provinces and regions all over the country and worldwide (1,2). On Jan 30, 2020, the WHO announced that 2019-nCoV epidemic in China would be listed as a public health emergency of international concern, causing psychological panic in many countries around the world. With the deepening of the understanding of the 2019-nCoV diseases, the National Health Commission of the People's Republic of China organized experts to continuously release four editions of the trial implementation version of the "Pneumonia Diagnosis and Treatment Program of 2019-novel Coronavirus Infection". It

provides scientific guidance for effective control of the epidemic disease.

Until now, the above guidelines and recent relevant reports all emphasized the symptoms of upper respiratory tract infection such as fever and cough, as well as the clinical features such as normal or reduced leukocyte count or decreased lymphocyte count in the early stage of the disease (3, 4).

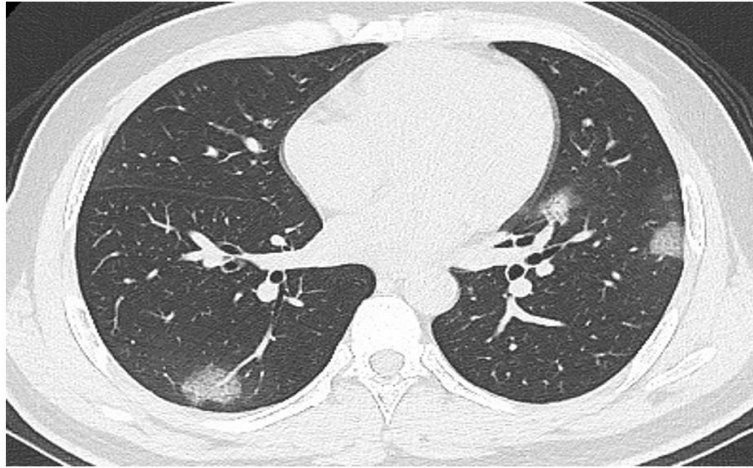
In the present report, a patient with a history of Wuhan live was admitted to our hospital with initial symptoms of anorexia. Finally, the patients was proved to be infected by 2019-nCoV with positive result of nucleic acid analysis in his respiratory specimens.

### Case report

The male patient was 32 yr old without history of hypertension, diabetes, bronchial asthma or

bronchiectasis. He came to Weihai from Wuhan in order to visit local relatives on Jan 22, 2020. On Jan 24<sup>th</sup>, the patient came to Rongcheng People's Hospital for medical treatment help because of the feelings of the loss of appetite and fatigue for one day. On admission, there were no symptoms of fever, cold, cough, sputum, palpitation,

shortness of breath, sore throat, muscle soreness, abdominal pain, abdominal distension or diarrhea. However, Chest CT on admission showed segmental subpleural exudation of multilobar lobes in both lungs (Fig. 1). Combined with epidemiological history of Wuhan living, we suspected the patient was infected by 2019-nCoV.



**Fig. 1:** Increased subpleural patches high density of multiple lobes in both lungs

Further physical examination revealed that a body temperature of 36.9 °C, blood pressure of 120/75 mm Hg, pulse of 84 beats per min, respiratory rate of 18 breaths per min, and oxygen saturation of 98% while the patient was breathing ambient air. His lung auscultation revealed rhonchi and no wet rales. Blood routine tests were performed on admission. The blood counts of patients on admission showed no leucopenia (white blood cell count [WBC] was  $7.3 \times 10^9$  mg/L) and no lymphopenia (lymphocyte count was  $1.8 \times 10^9$  /L). The proportion of neutrophil was 74.6%, and CRP level was high (45.8mg/L) as well as PCT level (0.03 mg/mL). The results of related blood biochemical tests were normal, and the results of influenza A and B virus detection were negative. On Jan 25, respiratory tract samples were positive for 2019-nCoV nucleic acid by real-time fluorescence RT-PCR. Therefore, the patient was diagnosed with 2019-nCoV pneumonia.

On the 1<sup>st</sup> day of hospitalization, oseltamivir was given as an antiviral treatment for him, moxiflox-

acin was used to control infection, and acetylcysteine were given for expectorant treatment. During hospitalization, a light diet was supplied, and the patient was demanded to take more rest and drink more water. On the 3<sup>rd</sup> day after admission, the patient developed a small amount of expectoration, which was white sticky sputum, the amount of it was less than 10mL/24h. On the 4<sup>th</sup> day, the patient felt muscle soreness in his extremities. During this period, transient runny nose, and vomiting occurred only on the 1<sup>st</sup> day, without any new symptoms (Fig. 2). On Jan 29, 2020, the patient's second respiratory tract specimen test was negative for novel coronavirus nucleic acid by real-time fluorescent RT-PCR. On Jan 31, 2020, the patient's third respiratory tract sample was positive for 2019-nCoV nucleic acid by real-time fluorescent RT-PCR. On Feb 2, 2020, the fourth respiratory tract specimen test result of the patient was positive for 2019-nCoV nucleic acid by real-time fluorescence RT-PCR. So far, he is still hospitalized for observation.

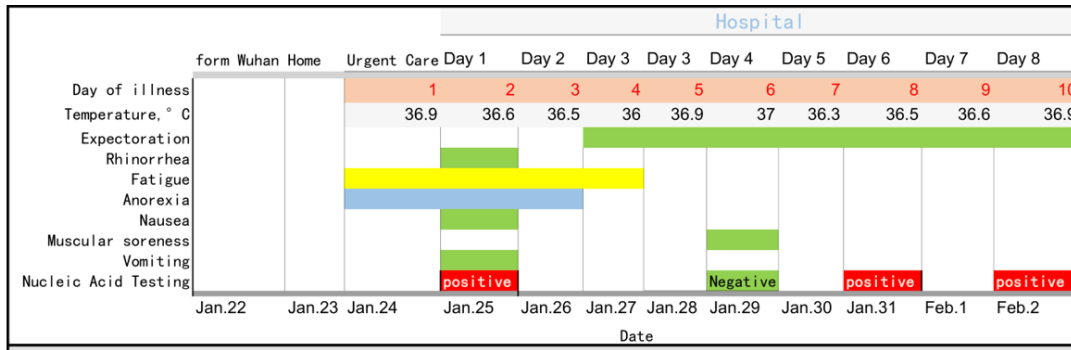


Fig. 2: Symptoms and nucleic acid testing according to day of illness and day of hospitalization January 24 to February 2, 2020

## Discussion

On Jan 12, 2020, the WHO named the novel coronavirus pneumonia in Wuhan, China, as "2019-novel coronaviral acute respiratory disease" (2019-nCoV acute respiratory disease), and issued clinical guidelines for severe acute respiratory infections caused by suspected novel coronavirus pneumonia. The National Health Commission of the People's Republic of China has successively issued four pilot editions of the "diagnosis and treatment Program for pneumonia infected with the novel Coronavirus" to provide up-to-date guidance for epidemic control and strengthening clinical treatment.

However, in its latest fourth edition of the guidelines, it is still emphasized that symptoms of "fever, fatigue, dry cough" is the main manifestation of the patients, only a small part of patients show low fever, mild fatigue, and without pneumonia. The diagnosis criteria of suspected cases included the related epidemiological history of Wuhan living or traveling, accompanied by fever and pneumonia imaging manifestations. In the early stage of the disease, laboratory examination showed that the total number of WBC were normal or decreased, or the lymphocyte count was reduced. Patient who met any two of the three items would be identified as suspected cases.

The suspected cases with one piece of etiological evidence (First, The real-time fluorescent RT-PCR of respiratory samples or blood samples is positive for the detection of 2019-nCoV novel

coronavirus nucleic acid; Second, The viral gene sequencing of respiratory samples or blood samples is highly homologous with the known 2019-nCoV new coronavirus) are confirmed cases. Similar views are also reported in some literature (5). The first symptoms of the patient were loss of appetite and fatigue, accompanied by the pneumonia imaging manifestations of typical mild viral lung injury. During hospitalization, the patient could move freely and had no other clinical manifestations such as fever, dry cough, shortness of breath, chest tightness and so on. Meanwhile, the results of 2019-nCoV nucleic acid test were positive for three times, which did not accord with the typical clinical characters of 2019-nCoV pneumonia.

On Jan 24, 2020, the patient's CRP level increased (CRP, 45.8 mg/L per liter). On Jan 26, 2020, CRP levels were normal (CRP, 7.9 mg/L). Blood routine and blood biochemical tests were normal. On Jan 31, 2020, CT re-examination of the patient's lungs showed that shadow range of mottled ground glass and the number of plaques in both lungs were significantly less than before improved. Because the real-time fluorescence RT-PCR detection of the novel coronavirus nucleic acid in the respiratory tract samples of the patients did not meet the negative standard for two consecutive times, and he did not meet the discharge standard of pneumonia caused by the 2019-nCoV 2019 novel coronavirus, so far, he has still been in hospital for observation.

In the fourth pilot edition of the pneumonia diagnosis and treatment program of the 2019-novel Coronavirus infection of the National Health Commission of the people's Republic of China, the standard for discharge of patients is stipulated as follow, the body temperature returns to normal for more than three days, the respiratory symptoms are significantly improved, the respiratory pathogen nucleic acid test is negative twice in a row (the sampling interval is at least one day), the isolation can be released and the patient can be discharged from the hospital. The author thinks that the above discharge criteria is too stringent and are not conducive to the

control of the current epidemic situation of illness. The discharge rate is low, and the extremely low discharge rate is also easy to cause the public to have the panic psychology of lingering disease and difficult to cure. The report on the epidemic situation of pneumonia with novel coronavirus infection released from the official website of the National Health Committee of the people's Republic of China on Jan 21, 2020 shows that the number of suspected cases, confirmed cases and critical cases are all increasing day by day, but the number of discharged patients is still at a low level (Figs. 3 and 4).

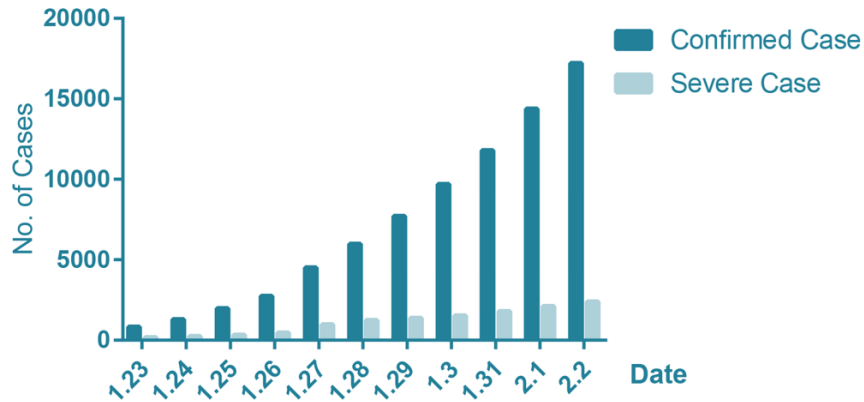


Fig. 3: Trend of confirmed cases and severe cases in China 2020

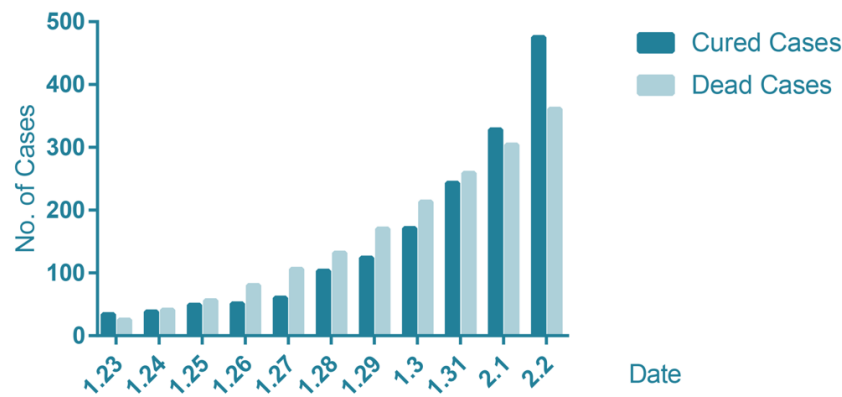


Fig. 4: Trend of cured cases and dead cases in China 2020

Especially in the central area of Wuhan, the number of confirmed cases and critical cases increased sharply, but the number of people discharged from hospital hovered extremely low. On the one hand, it caused difficulties in the turnover of hospital beds in medical institutions, and on the other hand, it was very easy to cause psychological panic among ordinary people and exaggerate the severity of the disease.

The fourth pilot edition of the "pneumonia diagnosis and treatment Program of Novel Coronavirus infection" of the National Health Commission of the people's Republic of China classifies the patients into ordinary type (with symptoms such as fever and respiratory tract, and the manifestation of pneumonia can be seen on imaging) and severe type (following any of the following: First, respiratory distress,  $RR \geq 30$  beats per min; Second, in the resting state, oxygen saturation of the patient was less than 93%; Third, Arterial arterial oxygen partial pressure/concentration of oxygen inhalation  $< 300\text{mmHg}$ ), critical (following one of the following conditions: First, respiratory failure and need for mechanical ventilation; Second, In shock).

According to the detailed analysis of the epidemic data reported, most of the diagnosed cases were ordinary patients. Most experts have a deep consensus on the epidemic, believing that a larger proportion of patients do not need hospitalization and can use home isolation and oral drug symptomatic treatment. At the same time, a considerable number of hospitalized patients belong to the common mild disease patients, the scope of lung tissue damage caused by the virus is less, and there is no secondary infection, but it is infectious to a certain extent, so it needs centralized isolated medical observation.

The worst-hit area of the epidemic-Wuhan and its surrounding areas, the effective beds, the number of medical personnel and the numbers of protective equipment are all in a tense state, and therefore the author proposes whether to consider relaxing the discharge criteria. Considering the context of epidemic prevention and control and clinical treatment needs. The discharge criteria is divided into two grades: stage I (grade) discharge and stage II (grade) discharge (Fig.5).

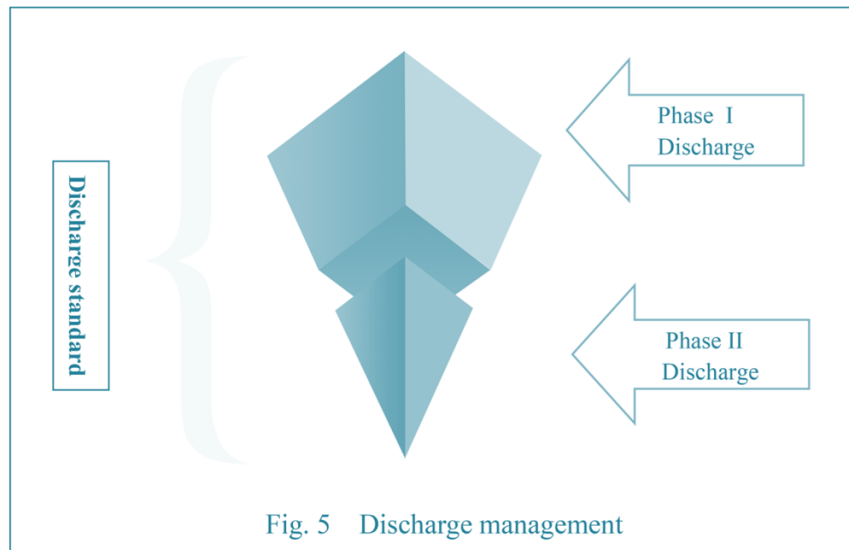


Fig. 5 Discharge management

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The discharge criteria of the first stage is as follows: normal body temperature, relief of clinical symptoms, improvement of lung imaging, signifi-

cant decrease of CRP levels, those patients who do not need intravenous infusion drug treatment, and only need oral antibiotics to control second-

ary infection or those treated with traditional Chinese medicine. In the second stage, the standard of discharge is for the body temperature to be returned to normal for more than three days, the respiratory symptoms obviously improved, and the detection of respiratory pathogenic nucleic acid negative twice in a row (the sampling interval was at least one day).

The main difference between the two stages is that the first-stage discharged patients do not take the negative detection of respiratory tract pathogenic nucleic acid as the standard. Because the negative result of respiratory pathogenic nucleic acid test was significantly behind the improvement of clinical symptoms.

There is a certain viral load level in the patients discharged from the first stage, which is contagious. The immune-inflammatory injury caused by the antigen and antibody immune reaction caused by the virus infection is in a balance of a certain level of micro-inflammation, and the organ function reserve of the patient is good. The probability of deterioration of the disease is very low, because it does not need in-hospital intravenous infusion treatment, oxygen inhalation and other special treatment measures.

Therefore, for stage I patients, the government can adopt centralized medical isolation and observation methods, such as renting an idle hotel near the hospital, and a small number of medical staff can also concentrate on observation and management of the patients until the standard of stage II discharge is reached. The use of such phased discharge management can effectively increase the bed turnover rate, avoid the huge waste of medical staff, and reduce the probability of infection. At the same time, under the guidance of doctors, various breathing exercises can be used to carry out functional rehabilitation training after lung injury and further improve the level of lung function of the patients after injury.

In the centralized management during this period (recommended no more than 14 d), due to the existence of different levels of antibodies in patients, there is no probability of mutual transmission, which is conducive to the prevention and control of the epidemic situation in the whole

society. Because the patients in the condition of stage I are in the recovery stage, the risk is very small, but it occupies a large proportion of hospitalized beds, reduces the bed turnover rate, squeezes out effective medical resources, and affects the efficient treatment of patients. Objectively, it also causes panic to the psychology of the common people. It cannot reflect the objective facts, nor is it conducive to patient management and efficient treatment of the epidemic situation.

The most important thing is that the use of phased discharge management can tilt the energy of the doctors and nurses and a large number of medical resources to the patients and transfer them to critically ill patient's treatment, which is conducive to improving the success rate of disease rescue.

WHO 2019-novel coronavirus guidelines classify patients into simple infection, mild pneumonia, severe pneumonia, acute respiratory distress syndrome, sepsis, septic shock (6). The fourth pilot edition of the diagnosis and treatment program of pneumonia infected by novel coronavirus of the National Health and Health Commission of the People's Republic of China divides the patients into three types: ordinary type, severe type and critical type.

The author thinks that it is too tedious and is also not conducive to the current epidemic control and clinical guidance. According to the clinical treatment of patients, they can be divided into simple infection, mild pneumonia (only need oral drug treatment), common pneumonia (requiring intravenous drug treatment, general oxygen therapy, close medical observation), severe (with  $\geq 2$  organ injuries or need non-invasive ventilator support, high flow oxygen therapy, etc.), critical ( $\geq 3$  organ injuries or need invasive ventilator support, artificial liver, renal replacement therapy, etc. and other patients who urgently need to be admitted to the intensive care department) (Fig. 6).

For simple infection and mild pneumonia, there is no need to be hospitalized, only centralized medical isolation observation and treatment can be adopted (the specific measures are still for the

government to rent hotels and other facilities near the hospital, using a small number of medical staff for centralized medical monitoring and observation, using WeChat and other means to strengthen psychological stress intervention measures. Once a case is found to be in progress, it will be transferred to hospital in time. The au-

thor thinks that the idea of phased treatment is helpful for clinical front-line doctors to judge the severity of illness and manage efficiently the patients in different levels, facilitate clinical guidance, reduce unnecessary hospitalization rate, and reduce public panic to a certain extent.

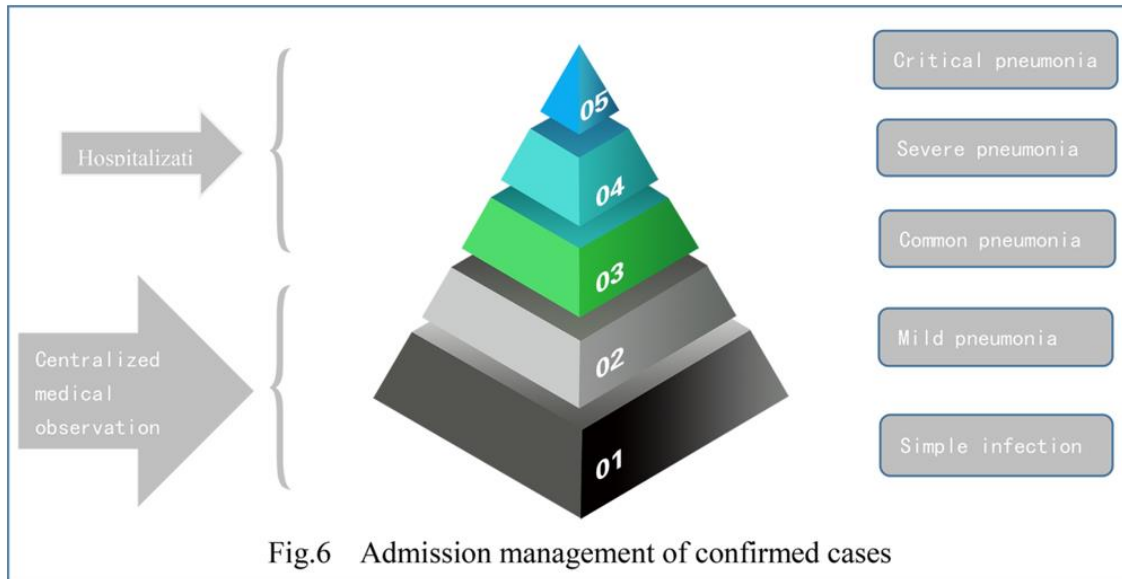


Fig.6 Admission management of confirmed cases

Fig. 6: Admission management of confirmed cases

## Conclusion

Therefore, this stage-by-stage discharge recommendation and stage-by-stage guidance strategy for hospitalization will help reduce the number of hospitalized patients, optimize the management process, strengthen patient management, reduce the waste of medical resources and concentrate on prevention and control measures. It is beneficial for the control of the epidemic to the maximum extent.

## Ethical considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

## Conflict of interest

The authors declare that there is no conflict of interest.

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