

# **The Clinical Features and Outcomes of Discharged Coronavirus Disease 2019**

## **Patients: A Prospective Cohort Study**

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## **Abstract**

**Background:** COVID-19 is a global pandemic but the follow-up data of discharged patients was barely described.

**Aims:** To investigate clinical outcomes, distribution of quarantine locations, and the infection status of the contacts of COVID-19 patients after discharge.

**Design:** A prospective cohort study

**Methods:** Demographics, baseline characteristics of 131 COVID-19 patients discharged from February 3 to 21, 2020 in Wuhan, China were collected and analyzed by reviewing the medical records retrospectively. Post-hospitalization data related to clinical outcomes, quarantine locations and close contact history were obtained by following up the patients every week up to 4 weeks.

**Results:** 53 (40.05%) patients on discharge had cough (29.01%), fatigue (7.63%), expectoration (6.11%), chest tightness (6.11%), dyspnea (3.82%), chest pain (3.05%), and palpitation (1.53%). These symptoms constantly declined in 4 weeks post discharge. Transient fever recurred in 11 (8.4%) patients. 78 (59.5%) discharged patients underwent chest CT and 2 (1.53%) showed deterioration. 94 (71.8%) patients received SARS-CoV-2 retest and 8 (6.10%) reported positive. 7 (2.29%) patients were re-admitted because of fever or positive SARS-CoV-2 retest. 121 (92.37%) and 4 (3.05%) patients were self-quarantined at home or community spots following discharge, with totally 167 closely contacted persons free of COVID-19 at the endpoint of study.

Conclusions: The majority of COVID-19 patients after discharge were in the course of recovery. Readmission was required in rare cases due to suspected recurrence of COVID-19. Although no contacted infection observed, appropriate self-quarantine and regular reexamination are necessary, particularly for those who have recurred symptoms.

**Key words:** COVID-2019; follow-up; discharged patients; outcomes

Since late December 2019, a cluster of patients with acute pneumonia symptoms, known as Coronavirus Disease 2019 (COVID-19), has emerged and promptly spread throughout the world. By April 29 2020, there were cumulatively 3,110,219 COVID-19 patients confirmed globally <sup>[1]</sup>. It is now officially a global outbreak, which has attracted the attention of the whole international community. So far, numerous studies have been conducted in this public thread, but with many of cohorts observed at the time of hospitalization <sup>[2-5]</sup>. However, the number of recovered and discharged COVID-19 patients keeps increasing in worldwide and the definite clinical outcomes of the patients with COVID-19 after discharge were scarcely described in the literature. In addition, the transmissibility of such patients post hospitalization is still uncertain.

To address these issues, we followed up 131 patients confirmed with COVID-19 who discharged from Tongji Hospital, a COVID-19 designated hospital in Wuhan, for 4 consecutive weeks. By gathering detailed information of symptoms and treatments, reexamined outcomes, distribution of quarantine locations and close contact history post hospitalization, we aimed to track the course of clinical outcomes of COVID-19 patients after discharge, and to evaluate their transmissibility during the period of observation, therefore to make improvement on post-discharge management if necessary.

## **Methods:**

### **Study Design and Patients**

This is a prospective cohort study performed in 147 confirmed COVID-19 cases who were discharged from Tongji Hospital between Feb 3, 2020 and Feb 21, 2020. Tongji Hospital affiliated to Tongji Medical College, Huazhong University of Science and Technology is a COVID-19 designated hospital in Wuhan, China. All of the discharged COVID-19 patients met the discharge criteria as follows: afebrile for at least three days, respiratory symptoms significantly improved, improvement in the radiological abnormalities on chest radiograph or CT, and two consecutive negative SARS-CoV-2 tests more than 24 hours apart [6]. 16 patients who either cannot be contacted after discharged or refused to participate in this study were excluded. Therefore, 131 COVID-19 patients were finally included. The study was approved by Ethics Committee of Tongji Hospital, Tongji Medical College, Huazhong University of Science and Technology (TJ-IRB20200217) and written informed consents were obtained from all the individuals who participated in the study.

### **In-hospital Data Collection**

The demographic data, onset symptoms, length of hospital stay, disease course (days from illness onset to discharge), severity of the COVID-19, complete blood count (CBC) and symptoms at discharge were obtained from patients' medical records. The onset symptoms or symptoms at discharge included fever, cough, expectoration, dyspnea, chest distress, chest pain, pharyngeal pain, rhinobyon, rhinorrhea, diarrhea, nausea, vomiting, inappetence, myalgia, fatigue, headaches, dizziness and palpitation.

CBC at discharge included white blood cell count, neutrophil count, lymphocyte count.

The severity of the COVID-19 was classified by reviewing the patients' medical data in accordance with Diagnosis and Treatment Program of COVID-19 (6th edition) [6]. More concretely, patients who only had fever, respiratory symptoms and imaging findings of pneumonia were defined as non-severe type, while patients who additionally had one of the following situations were defined as severe type: shortness of breath and the respiratory rate  $>30$  breaths/min, saturation of peripheral oxygen ( $SpO_2$ )  $<93\%$  at rest with room air, partial pressure of oxygen ( $PaO_2$ )/fraction of inspire oxygen ( $FiO_2$ )  $\leq 300$ mmHg, or pulmonary lesion progressed more than 50% in 24 to 48 hours by radiological imaging.

### **Follow-up after discharge**

Patients were followed up every 7 days up to 4 weeks after discharge. Based on the customized questionnaire, information regarding symptoms and treatment post hospitalization, reexamined outcomes, distribution of quarantine locations and close contact history after discharge was collected. The symptoms were recorded in the same items as at discharge. Detailed treatment of oxygen therapy and medicines after discharge were requested. The results of reexamination of SARS-CoV-2 nucleic acid test, CBC, and chest CT were contained in the questionnaire, if any. The data of quarantine locations and the detailed contact history of patients after discharge, as well as health state of the closely contacted persons were also recorded.

## **Statistical Analysis**

Analyses were performed using Graph Pad Prism (GraphPad Software, San Diego, CA, USA). All data of continuous variable were tested for normality using Shapiro–Wilk test. Continuous data are presented as mean  $\pm$  SD or median (IQR) in case of skewed data. Categorical outcomes were given as absolute and relative frequencies (%). According to the different data, statistical analysis between groups were analyzed using the two-tailed Mann Whitney test, un-paired two-tailed Student’s t test or two-sided Fisher’s exact test.  $P < 0.05$  indicates statistical significance.

## **Results:**

### **Demographics and Baseline Characteristics of COVID-19 Patients**

Among 131 discharged COVID-19 patients, 59 were male and 72 were female. The age ranged from 18 to 88 years and the median age was 49. 62 cases were classified as non-severe type and 69 to severe type. The median age of the severe patients was significantly older than non-severe patients (60 years versus 38 years,  $p < 0.05$ ). The leading comorbidity was hypertension (3.08%), followed by coronary heart disease (2.29%), diabetes (1.54%) and chronic bronchitis (0.76%) (Table 1). The 4 most common onset symptom was fever (87.02%), followed by cough (56.49%), fatigue (27.48%) and dyspnea (25.95%) (Supplementary Table 1). The median disease course was 25 days and the median length of hospital stay was 15 days.



### **Clinical Features of COVID-19 Patients on Discharge**

At the time of discharge, 78 of the 131 (59.54%) patients had no symptoms. However, 38 (29.01%) patients had cough, 10 (7.63%) had fatigue, 8 (6.11%) had expectoration, 8 (6.11%) had chest tightness, 5 (3.82%) had dyspnea, 4 (3.05%) had chest pain, 2 (1.53%) had dizziness and 2 (1.53%) had palpitation (Table 2). Other rare symptoms, including pharyngeal pain, nausea, inappetence and vomiting were presented in 1 (0.76%) patient, respectively. All of the 5 COVID-19 patients with dyspnea were severe. However, there was no statistical difference in the percentage of dyspnea between severe and non-severe patients (Table 2). The CBC at discharge showed lymphopenia (lymphocyte count  $<1.0 \times 10^9/L$ ) in 23 (17.56%) of patients. There was also no statistical difference in the percentage of lymphopenia between severe and non-severe patients (Table 1).

## **Symptoms of COVID-19 Patient after Discharge**

Observational follow up disclosed that during the first and the second week after discharge, 63 (48.09%) patients had one or more symptoms including cough (31.3%), fatigue (5.34%), expectoration (0.76%), chest tightness (6.11%), chest pain (3.05%), palpitation (2.29%), pharyngeal pain (1.53%), nausea (1.53%), inappetence (2.29%), vomiting (0.76%), diarrhea (0.76%), myalgia (0.76%) and rhinorrhea (0.76%). Fever (8.4%), dyspnea (7.63%) and headache (3.82%) were newly occurred. In the third and the fourth week after discharge, only 18 (13.74%) patients had one or more symptoms with the incidence of cough (9.16%), chest tightness (0.76%), dyspnea (1.53%), pharyngeal pain (1.53%) and nausea (0.76%) (Table 2). There was no statistical difference in the percentage of each symptom between severe and non-severe patients. The detailed data of symptoms at different time points after discharge was presented in Supplementary Table 2.

## **Laboratory Tests, Chest CT Findings and Treatments of COVID-19 Patients after Discharge**

In the first and the second week after discharge, 36 (27.48%) patients were tested for SARS-CoV-2, with 6 presented positive results. 14 (10.69%) patients accepted CBC, 12 of whom were normal. 36 (27.48%) patients underwent chest CT, among which 34 were recovered with no deterioration of pulmonary lesions (Fig. 1D), but 1 had enhanced inflammatory infiltrates and 1 presented multiple bilateral ground-glass opacities (BGGO) aggravated in the parenchyma (Fig. 2D). In the third and the fourth

week after discharge, 83 (63.36%) patients were tested for SARS-CoV-2 with only 2 presented positive. 50 (38.17%) patients accepted CBC tests, and 46 of them were normal. 54 (41.22%) patients underwent chest CT with all shown further absorption of infiltrates (Table 3). There was no statistical difference in the CBC tests results, percentage of deterioration in chest CT and positive in SARS-CoV-2 nucleic acid tests between severe and non-severe patients.

During the first and the second week after discharge, 70 (53.4%) of the 131 patients had one or more treatment as Chinese traditional medicine (22.9%), followed by cough medicine (11.46%), oxygen therapy (6.87%), corticosteroids (3.82%), expectorants (4.58%), re-hospitalization (3.82%). During the third and the fourth week after discharge, only 17 (13.0%) had treatment with the frequency of medicine attenuated in comparison of the first two weeks as follows: Chinese traditional medicine (6.11%), cough medicine (0.76%), oxygen therapy (0.76%), corticosteroids (1.53%), and re-hospitalization (2.29%) (Supplementary Table 3). There was no statistical difference in the percentage of each treatment between severe and non-severe patients.

### **Distributions of Quarantine Locations, Contact History of COVID-19 Patients after Discharge**

114 (87.02%) of the 131 patients were quarantined at home, 12 (9.16%) were in community quarantine spot, 5 (3.82%) were readmitted to designated hospital in the first and the second week after discharge (Table 4). Among those quarantined at

home, 68 (51.91%) patients were living with family while 46 (35.11%) were living alone. All the discharged 131 patients had close contact with 111 persons in total. None of the contacted persons were diagnosed with COVID-19 but only two had slight cough.

During the third and the fourth week after discharge, 121 (87.02%) of the 131 patients were quarantined at home, 4 (9.16%) were in community quarantine spot, 3 (3.82%) were re-admitted (Table 4) and 3 resumed to work. Among those quarantined at home, 85 (64.89%) were living with family while 36 (35.11%) were living alone. All the patients had close contact with 167 persons in total. These contacted persons neither diagnosed with COVID-19 nor had any respiratory symptoms in this follow-up period.

### **The outcomes of 8 Positive SARS-CoV-2 Tests Patients after Discharge**

8 COVID-19 patients retested positive SARS-CoV-2 result after discharge. The median age was 46.5 years. Half of them were male and all were asymptomatic at the time of discharge. 2 of the 8 patients had fever after discharge and underwent SARS-CoV-2 nucleic acid tests in the clinic. The other 6 patients had no obvious symptom after discharge. 7 patients performed the chest CT showing that the infiltrates were gradually absorbed in 6 of them and were aggravated in 1 patient. 4 patients were readmitted to designated hospital, and the others were quarantined in community spots or at home. At the endpoint of this study, 7 showed negative SARS-CoV-2

nucleic acid tests (Table 5). None of them had contacted infection after discharge during the follow-up period.

Patient 2 was a special case that needs to be specifically reported. The patient was a 40-year-old male. He was admitted, confirmed with COVID-19, classified as severe type, and treated for 19 days until discharge criteria were reached. However, 5 days after discharge, he had fever again (37.8°C), and was disclosed with positive SARS-CoV-2 and aggravated multiple BGGO on chest CT (Fig. 2D). The patient was hence readmitted for further treatment. He presented negative SARS-CoV-2 and improved chest CT after 1 week of treatment (Fig. 2E, Table 5).

## **Discussion:**

This follow-up study reports the largest cohort so far regarding the post-hospitalization features of COVID-19 patients. We have systematically tracked the clinical characteristics in terms of symptoms, laboratory tests, chest CT images and treatment of the discharged COVID-19 patients in a time frame of 4 weeks. The distribution of quarantine locations as well as contact history post discharge was also investigated.

Our retrospective analyses of 131 discharged patients reconfirmed that the majority of severe COVID-19 patients (82.61%) were clustered above of 40 years old [2-5, 7, 8], with the median age notably older than the non-severe patients (60 years versus 38 years). Hypertension and coronary artery disease were prominent comorbidities of COVID-19, with the most common onset symptoms of fever (87.02%) followed by cough (56.49%), fatigue (27.48%) and dyspnea (25.95%), particularly for those severe ones (Supplementary Table 1), which was similar to previous reports [5, 7, 9].

In this follow-up study, we have observed that the majority of patients with COVID-19, both in severe and non-severe groups, were on the course of recovery after discharge. This could be evidenced by the mitigation of overall symptoms, and improved chest CT diagnosis during the course of 4 weeks of post-hospitalization period (Table 2 and 3). Although prominent onset symptoms such as fever, fatigue and dyspnea were significantly alleviated, some residual symptoms such as cough (29.01%), expectoration (6.11%) and chest tightness (6.11%), dyspnea (3.82%), etc

were still visible at the time of discharge. The incidence of such symptoms consistently diminished during the following 4 weeks of recovery course, as detailed in Supplementary Table 2. Indeed, relatively persistent cough and/or dyspnea of the patients after discharge were merely mild, bothering neither daily activities nor sleep. Besides, we have found that post-discharge treatments, particularly after the second week, were mainly anti-symptomatic or supportive. Additional treatments were barely reported from the patients. Our data, from symptomatic perspective, confirmed the adequacy of current discharge criteria.

However, 11 patients were surprisingly associated with recurrent but transient fever in the first or second week post discharge. 6 of them underwent SARS-CoV-2 re-examination with 2 positive presented (Patient 2 and 3 in Table 5). Further follow-up found that Patient 2 was associated with chest CT abnormality as recurred and aggregated bilateral ground glass opacities (Fig. 2D), and was redirected to the designated hospital for the extended observation. He resolved with three times of negative SARS-CoV-2 tests and improved chest CT (Table 5, Fig. 2F) in the next 3 weeks without obvious symptoms after appropriate treatment. Taking clinical features together, it was suspected that COVID-19 was recurrent in this particular patient. Whereas Patient 3 was asymptomatic except transient fever, with SARS-CoV-2 test turning negative 3 weeks after discharge without specialized treatment. The other febrile patients who were quarantined either at home or at designated locations were absent of respiratory symptoms in next few weeks. These results suggested that post

discharge fever may point to the recurrence of COVID-19, thus cautions must be taken with necessary retest of SARS-CoV-2 and chest CT.

Notably, 8 out of 131 patients were positive in the SARS-CoV-2 retest after discharge. They were all affirmatively quarantined either in designated hospital or community spot without contact any other persons at least for 2 weeks, since positive SARS-CoV-2 identified. Among them, 1 patient was febrile again associated with deteriorated chest CT, as discussed above (Patient 2 in Table 5). However, the clinical characteristics of Patient 2 was not in line with other 7 patients, who retested with positive SARS-CoV-2 but were only associated with mild symptoms as dry cough or intermittent fever and ultimately pronounced negative tests and improved chest CT during 4 weeks of follow-up period. Above information suggests that, positive SARS-CoV-2 test after discharge may not refer to the deterioration of patient's condition. But to evaluate patients whether reinfected with COVID-19, more observation and laboratory or radiological examination are in need. Yet, sufficient care and quarantine must be taken for such patients, since it possibly implies that they can still be contagious.

There were a couple of factors possibly accounting for the results of SARS-CoV-2 nucleic acid test. In one aspect, locations of sampling may play a major role as reported that higher viral loads are more easily to be detected in the nose than in the throat <sup>[10]</sup>. In another aspect, comprehensive factors such as technical variation of specimen collection, manipulation, as well as the sensitivity of detection kit might



have negative impact on the result of nuclei acid assay <sup>[11]</sup>. As a matter of fact, positive patients after discharge in our study were barely symptomatic, suggesting that COVID-19 patient may shed variation of viral load resembling that of asymptomatic viral carriers with influenza <sup>[12]</sup>. SARS-CoV-2 may be long-standing in confirmed patients, with the viral pathogenicity depending on the immuno-status of the host, the severity of lesions, response to the therapeutic interventions and recovery course <sup>[13-15]</sup>. Thus, conclusion of recurrence of COVID-19 with reappearing of positive SARS-CoV-2 test alone shall be very carefully drawn.

We also investigated the distribution of post-hospital quarantine locations and contact history to further explore the contagious potentiality of discharged COVID-19 patients. 87.02% of patients were home self-quarantined during the first two weeks, of which more than half (51.91%) of them were living with family, with the close contact persons of 111 in total (Table 4). As time lapsed, more patients were living with family in the third and fourth week after discharge with closely contacted persons increased to 167. Fortunately no suspected or confirmed COVID-19 cases were reported among contacted persons at the endpoint of the study, although prolonged incubation period was discovered elsewhere <sup>[7]</sup>. What's more, 7 persons who had contact history with 2 positive SARS-CoV-2 patients (Patient 1 and 3) were free of COVID-19 during 2 weeks of observation period (Table 5). However, the transmissibility of discharged COVID-19 patients was still uncertain in the current study, since it was not completely evidenced for retested positive SARS-CoV-2 patients who were quarantined without contacting others in the observation time.

More studies to isolate or culture SARS-CoV-2 from those patients may be required to fully address this issue.

Our study has limitations. Firstly, real time RT-PCR assay detects 2 regions (ORF1b and N) of the SARS-CoV-2 genome of samples from COVID-19 [16], therefore positive result does not directly implicate the viability of virus infection. To ensure the reinfection of discharged patient, viral isolation is needed. This can be confirmed in the further investigation. Secondly, this study tracked the discharged COVID-19 patients up to 4 weeks, with relatively limited information regarding contact history of patients, particularly for those resume to work. Prolonged observation is necessary to solidly conclude the transmissibility of such patients.

In summary, our follow-up study found that the majority of COVID-19 patients after discharge were in the course of recovery, confirmed by the alleviated symptoms, improved laboratory tests and radiological assessment in the 4 weeks of observation period. However, re-hospitalizations were needed in rare patients, due to the recurred fever and positive SARS-CoV-2 tests. Although contacted infection was not evidenced, our study recommends that appropriate quarantine and regular clinical reexamination in an extended period is essential for the discharged COVID-19 patients, particularly for those have recurred symptoms. For countries been suffering from COVID-19 outbreak, this study could provide certain reference in the management of post-hospitalization for COVID-19 patients.

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Table 1. Demographics, baseline clinical characteristics of COVID-19 discharged patients.

	Total (N=131)	Non-severe (N=62)	Severe (N=69)	<i>p</i> value <sup>a</sup>
<b>Demographics</b>				
Age, median (IQR), years	49(36, 62)	38(32, 51)	60(46, 67)	<0.0001
Age stratification, years				
≤40	48(36.64)	36(58.06)	12(17.39)	—
41-64	57(43.51)	21(33.87)	36(52.17)	—
≥65	26(19.85)	5(8.06)	21(30.43)	—
Male	59(45.04)	23(37.10)	36(52.17)	0.1133
Female	72(54.96)	39(62.90)	33(47.83)	0.1133
Length of hospital stay, median (IQR), days	15.0 (12.0, 19.0)	15.0 (12.0, 19.0)	15.0 (11.0, 18.0)	0.5738
Disease course, median (IQR), days	25.0 (21.0, 28.0)	25.5 (22.0, 28.0)	25.0 (19.0, 27.3)	0.1455
<b>Comorbidities</b>				
Hypertension	4(3.08)	1(1.61)	3(4.35)	0.2120
Coronary heart disease	3(2.29)	1(1.61)	2(2.90)	>0.9999
Diabetes	2(1.54)	0(0.00)	2(2.90)	0.4976
Chronic bronchitis	1(0.76)	1(1.61)	0(0.00)	0.4733
Kidney transplant	1(0.76)	0(0)	1(1.45)	0.8132
Leukocytes, *10 <sup>9</sup> /L (3.5-9.5)	5.55	5.38	6.15	0.1231
Neutrophils, *10 <sup>9</sup> /L (1.8-6.3)	3.72	3.36	4.09	0.1311
Lymphocytes, *10 <sup>9</sup> /L (1.1-3)	1.44	1.51	1.35	0.4956

<1.0 *10 <sup>9</sup> /L	23(17.56)	7(11.29)	16(23.19)	0.1066
≥1.0 *10 <sup>9</sup> /L	108(82.44)	55(88.71)	53(76.81)	0.1066

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Data presented as n or n (n/N%), unless otherwise specified, where N is the total patients in the respective column.

<sup>a</sup>*p value* indicate differences between Non-severe and Severe groups.

Table 2. Symptomatic evolution of COVID-19 patients after discharge.

	Discharge				1 <sup>st</sup> & 2 <sup>nd</sup> week after discharge				3 <sup>rd</sup> & 4 <sup>th</sup> week after discharge			
	Total (N=131)	Non-severe (N=62)	Severe (N=69)	<i>p</i> value <sup>a</sup>	Total (N=131)	Non-severe (N=62)	Severe (N=69)	<i>p</i> value <sup>a</sup>	Total (N=131)	Non-severe (N=62)	Severe (N=69)	<i>p</i> value <sup>a</sup>
No symptoms	78(59.54)	35(56.45)	43(62.31)	0.5931	68(51.91)	28(45.16)	40(57.97)	0.1636	113(86.26)	53(85.48)	60(86.96)	>0.9999
Fever	0(0)	0(0)	0(0)	—	11(8.4)	6(9.68)	5(7.25)	0.7555	0(0)	0(0)	0(0)	—
Cough	38(29.01)	22(35.48)	16(23.19)	0.1289	41(31.3)	25(40.32)	16(23.19)	0.0396	12(9.16)	8(12.9)	4(5.8)	0.2264
Fatigue	10(7.63)	6(9.68)	4(5.8)	0.516	7(5.34)	2(3.23)	5(7.25)	0.4451	0(0)	0(0)	0(0)	—
Expectoration	8(6.11)	5(8.06)	3(4.35)	0.4755	1(0.76)	1(1.61)	0(0)	0.4733	0(0)	0(0)	0(0)	—
Chest tightness	8(6.11)	3(4.84)	5(7.25)	0.7212	8(6.11)	4(6.45)	4(5.8)	>0.9999	1(0.76)	0(0)	1(1.45)	>0.9999
Dyspnea	5(3.82)	0(0)	5(7.25)	0.0595	10(7.63)	1(1.61)	9(13.04)	0.0186	2(1.53)	0(0)	2(2.9)	0.4976
Chest pain	4(3.05)	2(3.23)	2(2.9)	>0.9999	4(3.05)	3(4.84)	1(1.45)	0.3441	0(0)	0(0)	0(0)	—
Dizziness	2(1.53)	0(0)	2(2.9)	0.4976	0(0)	0(0)	0(0)	—	0(0)	0(0)	0(0)	—
Palpitation	2(1.53)	2(3.23)	0(0)	0.2221	3(2.29)	2(3.23)	1(1.45)	0.6027	0(0)	0(0)	0(0)	—
Pharyngeal pain	1(0.76)	0(0)	1(1.45)	>0.9999	2(1.53)	1(1.61)	1(1.45)	>0.9999	2(1.53)	0(0)	2(2.9)	0.4976
Nausea	1(0.76)	1(1.61)	0(0)	0.4733	2(1.53)	1(1.61)	1(1.45)	>0.9999	1(0.76)	0(0)	1(1.45)	>0.9999
Inappetence	1(0.76)	1(1.61)	0(0)	0.4733	3(2.29)	1(1.61)	2(2.9)	>0.9999	0(0)	0(0)	0(0)	—
Vomiting	1(0.76)	0(0)	1(1.45)	>0.9999	1(0.76)	1(1.61)	0(0)	0.4733	0(0)	0(0)	0(0)	—
Headache	0(0)	0(0)	0(0)	—	5(3.82)	1(1.61)	4(5.8)	0.3689	0(0)	0(0)	0(0)	—
Diarrhea	0(0)	0(0)	0(0)	—	1(0.76)	1(1.61)	0(0)	0.4733	0(0)	0(0)	0(0)	—
Myalgia	0(0)	0(0)	0(0)	—	1(0.76)	1(1.61)	0(0)	0.4733	0(0)	0(0)	0(0)	—
Rhinorrhea	0(0)	0(0)	0(0)	—	1(0.76)	1(1.61)	0(0)	0.4733	0(0)	0(0)	0(0)	—

Data presented as n (n/N%), where N is the total patients in the respective column.

<sup>a</sup> *p* value indicate differences between Non-severe and Severe groups. *P*<.05 was considered statistically significant.



Table 3. Laboratory tests and chest CT of COVID-19 patients after discharge.

	1 <sup>st</sup> & 2 <sup>nd</sup> week after discharge				3 <sup>rd</sup> & 4 <sup>th</sup> week after discharge			
	Total	Non-	Severe	<i>p</i> value <sup>a</sup>	Total	Non-	Severe	<i>p</i> value <sup>a</sup>
		severe				severe		
	(N=131)	(N=62)	(N=69)		(N=131)	(N=62)	(N=69)	
<b>SARS-CoV-2</b>	36(27.48)	18(29.03)	18(26.09)	0.8448	83(63.36)	36(58.06)	47(68.12)	0.2773
Positive	6(4.58)	2(3.23)	4(5.8)	0.6829	2(1.53)	2(3.23)	0(0)	0.2221
Negative	30(22.9)	16(25.81)	14(20.29)	0.5339	81(61.83)	34(54.84)	47(68.12)	0.1529
<b>CBC</b>	14(10.69)	8(12.9)	6(8.7)	0.5732	50(38.17)	23(37.1)	27(39.13)	0.8582
Normal	12(9.16)	7(11.29)	5(7.25)	0.5477	46(35.11)	22(35.48)	24(34.78)	>0.9999
Abnormal	2(1.53)	1(1.61)	1(1.45)	>0.9999	4(3.05)	1(1.61)	3(383.33)	0.6214
<b>Chest CT image</b>	36(27.48)	20(32.26)	16(23.19)	0.3272	54(41.22)	29(46.77)	25(36.23)	0.2863
Non-deteriorated	34(25.95)	20(32.26)	14(20.29)	0.1621	54(41.22)	29(46.77)	25(36.23)	0.2863
Deteriorated	2(1.53)	0(0)	2(2.9)	0.4976	0(0)	0(0)	0(383.33)	>0.9999

Data presented as n or n(n/N%), where N is the total patients in the respective column.

CBC: Complete blood count.

<sup>a</sup>*P* values indicate differences between non-severe and severe patients.

*P*<.05 was considered statistically significant.

Table 4. Quarantine location and contact history of COVID-19 patients after discharged.

	1 <sup>st</sup> & 2 <sup>nd</sup> week after discharge				3 <sup>rd</sup> & 4 <sup>th</sup> week after discharge			
	Total	Non-severe	Severe	p value <sup>a</sup>	Total	Non-severe	Severe	p value <sup>a</sup>
	(N=131)	(N=62)	(N=69)		(N=131)	(N=62)	(N=69)	
<b>Distribution of quarantine locations after discharge</b>								
Home quarantine in total	114(87.02)	56(90.32)	58(84.06)	0.3117	121(92.37)	56(90.32)	65(94.2)	0.516
Home quarantine living with family	68(51.91)	35(56.45)	33(47.83)	0.3823	85(64.89)	44(70.97)	41(59.42)	0.2008
Home quarantine living alone	46(35.11)	21(33.87)	25(36.23)	0.8552	36(27.48)	12(19.35)	24(34.78)	0.0529
Community quarantine spots	12(9.16)	5(8.06)	7(10.14)	0.7677	4(3.05)	3(4.84)	1(1.45)	0.3441

Designated hospital	5(3.82)	1(1.61)	4(5.8)	0.3689	3(2.29)	1(1.61)	2(2.9)	>0.9999
Resume to work	0(0.00)	0(0.00)	0(0.00)	—	3(2.29)	2(3.23)	1(1.45)	0.6027

**Contact history after discharge**

Contacted persons (CP) in total	111	53	58	—	167	83	84	—
CP with respiratory symptoms	2	2	0	—	0	0	0	—
CP diagnosed with COVID-19	0	0	0	—	0	0	0	—

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Data presented as n or n (n/N%), unless otherwise specified, where N is the total patients in the respective column.

CP: Contacted persons.

<sup>a</sup>*p value* indicate differences between Non-severe and Severe groups.

P<.05 was considered statistically significant.

Table 5. Clinical characteristics and follow-up of COVID-19 discharged patients with recurred positive SARS-CoV-2 nucleic acid test.

	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5	Patient 6	Patient 7	Patient 8
<b>Clinical characteristics</b>								
Age (years)	30	40	37	58	53	70	32	70
Gender	Female	Male	Female	Female	Male	Male	Female	Male
Severity classification	Non-severe	Severe	Non-severe	Severe	Severe	Severe	Non-severe	Non-severe
Comorbidity	None	None	None	None	None	None	None	None
<b>1st week after discharge</b>								
Symptoms	None	Fever(37.8°C)	None	None	None	None	Cough	None
Chest CT	Non-deteriorated	Aggravated BGA	Not done	Infiltrates absorbed	Not done	Not done	Not done	Not done
SARS-CoV-2	Positive	Positive	Not done	Positive	Positive	Not done	Not done	Not done
Quarantine locations	Designated hospital	Designated hospital	Community spot	Community spot	Community spot	Home	Home	Home
<b>2nd week after discharge</b>								
Symptoms	None	None	Fever(37.6°C)	None	None	None	Cough	None

Chest CT	Infiltrates absorbed	BGGA remained	Not done	Infiltrates absorbed	Infiltrates absorbed	Infiltrates absorbed	Infiltrates absorbed	Not done
SARS-CoV-2	3 times of negative	Negative	Positive	2 times of negative	Negative	Positive	Not done	Positive
Quarantine locations	Designated hospital	Designated hospital	Community spot	Community spot	Community spot	Designated hospital	Home	Designated hospital
<b>3rd &amp; 4th week after discharge</b>								
Symptoms	None	None	Cough	None	None	None	None	None
Chest CT	Infiltrates absent	Infiltrates absent	Not done	Not done	Infiltrates absent	Infiltrates absent	Infiltrates absent	Infiltrates absorbed
SARS-CoV-2	2 times of negative	2 times of negative	Negative	Negative	2 times of negative	2 times of negative	Positive	2 times of negative
Quarantine locations	Home	Designated hospital	Community spot/home	Home	Community spot	Designated hospital	Community spot	Designated hospital
No. of CP	3	0	4	0	0	0	0	0
CP with COVID-19	0	0	0	0	0	0	0	0

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BGGA: bilateral ground glass opacities; P: positive; CP: contacted persons

## FIGURE LEGENDS

Figure 1. Representative chest CT of a discharged COVID-19 patient.

A 39 years old male patient with fever and cough as onset symptoms. (A) Chest CT showed ground-glass opacities in the left lung 9 days after the onset. (B) Multiple bilateral ground-glass opacities started to absorb 15 days after the onset. (C) Multiple bilateral ground-glass opacities further absorbed 19 days after the onset. (D) Most of the ground-glass opacities were absorbed 48 days after the onset (28 days after discharge).

Figure 2. Representative chest CT of a COVID-19 patient with recurred positive SARS-CoV-2 after discharge.

A 40 years old male patient who was re-admitted after first discharge from hospital. A, Chest CT on January 20, 2020, show multiple bilateral ground-glass opacities in lungs 2 days after symptom onset. B, Image take on January 24, 2020, show the progressed multiple bilateral ground-glass opacities 6 days after symptom onset. C, Chest CT on February 3, 2020, show most of the ground-glass absorbed 13 days after symptom onset. D, Chest CT on February 13, 2020, multiple bilateral ground-glass opacities were aggravated 23 days after symptom onset (5 days after the first discharge from hospital). The patient was readmitted to designated hospital after the chest CT scan. E, Chest CT on February 18, 2020, show multiple bilateral ground-glass opacities were further aggravated 28 days after onset (10 days after the first discharge). F, Chest CT on February 29, 2020, show multiple bilateral ground-glass opacities were re-absorbing 39 days after onset (21 days after the first discharge).

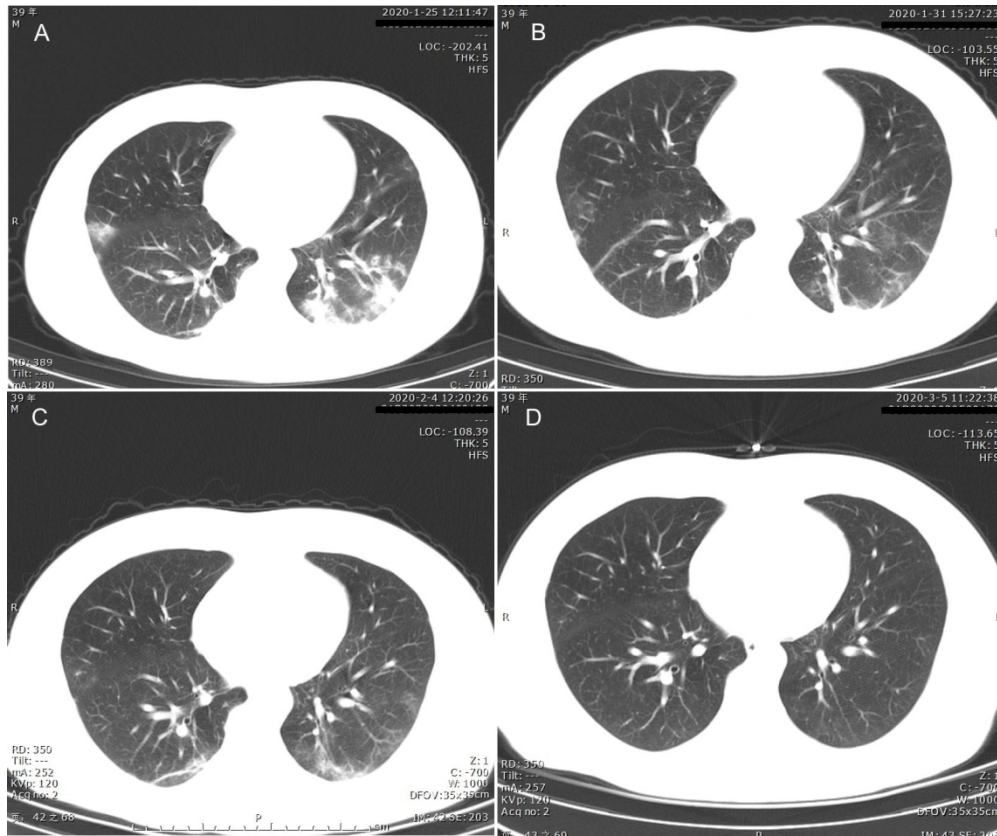


Figure 1. Representative chest CT of a discharged COVID-19 patient. A 39 years old male patient with fever and cough as onset symptoms. (A) Chest CT showed ground-glass opacities in the left lung 9 days after the onset. (B) Multiple bilateral ground-glass opacities started to absorb 15 days after the onset. (C) Multiple bilateral ground-glass opacities further absorbed 19 days after the onset. (D) Most of the ground-glass opacities were absorbed 48 days after the onset (28 days after discharge).

274x228mm (150 x 150 DPI)



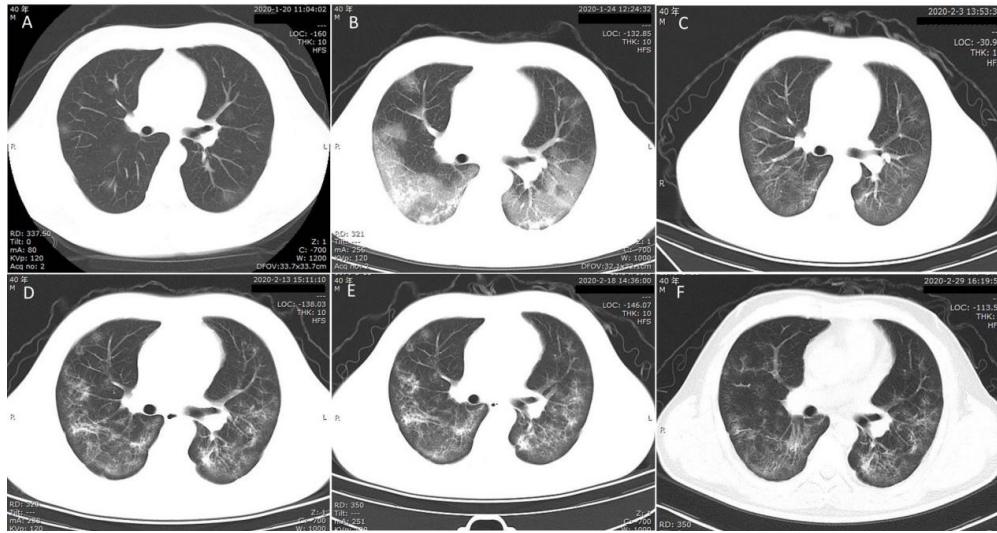


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146x77mm (220 x 220 DPI)