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Analysis on Related Factors of Hospitalization Days of Patients with Novel Coronavirus Pneumonia in Fangcang Shelter Hospitals

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Abstract: *Objective:* To study the factors influencing the length of stay in patients with COVID-19. *Methods:* The clinical data of 110 patients with COVID-19 who were infected with Omicron virus for more than 10 days from April to May 2022 were collected. Their gender, age, smoking status, clinical manifestations related to pneumonia, whether they were combined with other basic diseases and vaccination status were analyzed. The above influencing factors were analyzed by single factor regression analysis, followed by Cox regression model analysis. *Results:* The age of patients had an effect on the length of hospital stay. The median length of hospital stay of patients that are < 50 years old, 50-64 years old and ≥ 65 years old were 14, 14, and 17 days respectively ($\chi^2 = 9.346$, $P = 0.009$). The presence of coronavirus-related symptoms also affects the length of hospital stay ($\chi^2 = 4.840$, $P = 0.028$). The results of multivariate regression model showed that age ($\chi^2 = 8.669$, $P = 0.006$) and coronavirus-related symptoms ($\chi^2 = 5.424$, $P = 0.020$) were independent factors affecting the length of hospital stay. *Conclusion:* During the development of COVID-19, the age of patients and whether they have coronavirus-related symptoms are positively correlated with the length of stay. Gender, habit of smoking, presence of other basic diseases and vaccination are not related to the length of stay.

Keywords: Omicron; Hospitalization days; Influencing factors; Clinical analysis

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1. Introduction

Coronavirus disease was named COVID-19 by the World Health Organization (WHO) on February 11, 2020 [1], and then it continued to mutate. On November 24, 2021, the world health organization (WHO) received a report of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) variant B.1.1.529 from South Africa. On the same day, it was listed as "closely monitored variant"; on November 26, the WHO "COVID-19 Evolution Technology Advisory Group" launched an evaluation. According to the evaluation results, the variant was named Omicron [2]. Researchers said that the proliferation rate of Omicron mutant in airway tissue was 70 times faster than that of Delta mutant in the early stage, which may accelerate the

transmission between people [3]. However, the replication rate of Omicron mutant in lung tissue is 10 times slower than that of the original coronavirus, which may lead to mild illness [4]. In addition, every patient's constitution is different, and the course of disease is not very similar. Therefore, the influencing factors in the course of disease should be studied emphatically. This year's epidemic in Shanghai is due to the large-scale spread of Omicron infection, and there is no research on the factors affecting the infection course of Omicron mutant. This study analyzed the clinical data of 110 asymptomatic or light Omicron infected patients admitted to the shelter Hospital of Shanghai International Exhibition Center. The factors affecting the total course of disease were studied, which is of practical significance for patients' prognosis, assistance in diagnosis and treatment, evaluation of medical load, rational use of medical resources, etc.

2. Data and methods

2.1. General information

110 asymptomatic or mild patients with Omicron infection who were hospitalized for more than 10 days in the Shelter Hospital of the National Exhibition Center from April to May 2022 were collected and analyzed retrospectively through the electronic medical record system. All of them met the diagnostic criteria of Omicron infection. All patients fully recovered and discharged under the treatment of medical team members, and there were no deaths. The data used in this study were collected from electronic medical record isolation and further inquiries were made if necessary. It did not require informed consent as it did not involve personal privacy. Personal data is only used for this study and the details of the patients will not be disclosed.

2.2. Methods

2.2.1. Treatment methods

The data in the electronic medical record system of 110 asymptomatic or mild patients with Omicron infection who were hospitalized for more than 10 days were retrospectively analyzed, and the length of hospitalization and the influencing factors in the course of the disease were counted. The investigation was divided into 6 items which are as follows: The general data of patients include gender, age, smoker/non-smoker, whether there are symptoms related to COVID-19, the number of vaccinations, and whether there are other basic diseases.

2.2.2. Observation indicators

The general information of the patient, including gender and age was recorded. The risk factors of Omicron infected patients were calculated, including smoking or not, clinical manifestations related to pneumonia such as fever, cough, expectoration, sore throat, fatigue, shortness of breath, the number of vaccinations, and basic diseases such as hypertension, diabetes, chronic obstructive pulmonary disease (COPD), tumor, and so on.

2.3. Statistical processing

SPSS 22.0 statistical software package was used for statistical analysis, single factor analysis with logrank method and multivariate analysis with Cox regression model. The difference was statistically significant ($p < 0.05$).

3. Results

3.1. Single factor analysis

Factors affecting the length of hospital stay: Age, sex, smoking, underlying diseases, COVID-19 related symptoms, and vaccination (see **Table 1**). The overall median length of stay was 15 days (see **Figure 1**).

Among them, the median length of hospital stay was 14 days for < 50 years old, 14 days for 50–64 years old, and 17 days for ≥ 65 years old, and the results showed that the age difference had a statistically significant effect on the length of hospital stay (χ^2 = 9.346, P = 0.009) (see **Figure 2**).The median hospitalization time of patients with and without COVID-19 related symptoms was 14 days and 16 days respectively, and the results were statistically significant (χ^2 = 4.840, P = 0.028) (see **Figure 3**).

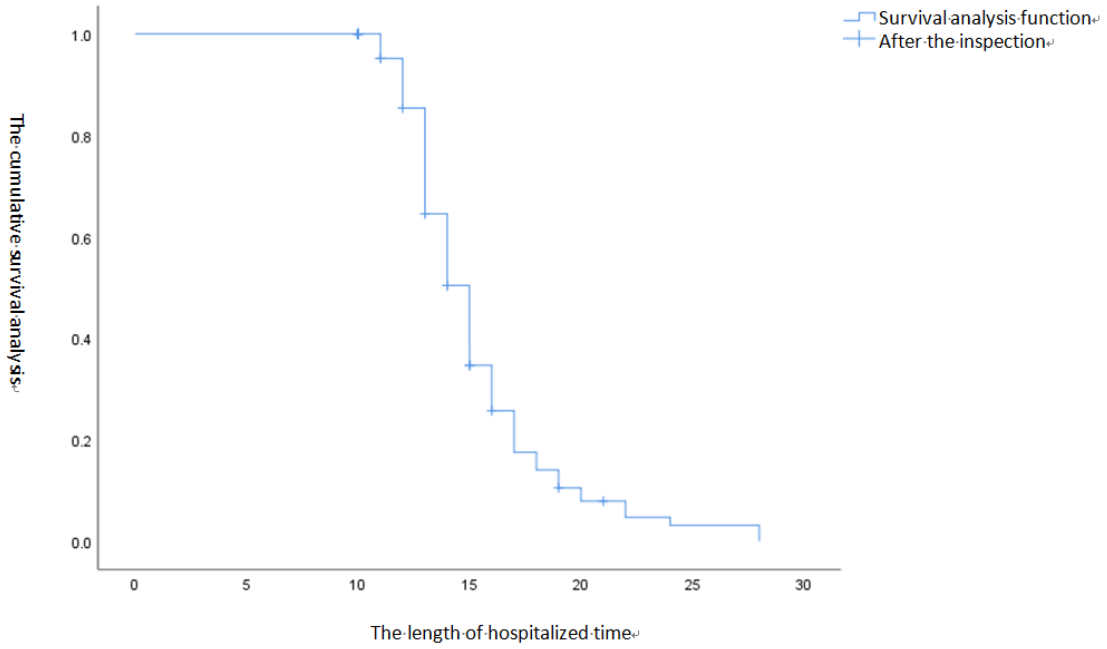

Figure 1. Total length of stay

Table 1. Single factor analysis

Factor		Number of cases	Median length of hospital stay	χ^2	p
The total number of cases		112	15		
Age				9.346	0.009
	< 50 years old	59	14		
	50-64 years old	34	14		
	≥ 65 years old	19	17		
Gender				1.294	0.255
	Male	77	14		
	Female	35	15		
Smoking				1.651	0.199
	Yes	30	15		
	No	82	14		
Basic diseases				0.088	0.766
	Yes	30	14		
	No	82	15		

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Neocoronal symptoms				4.840	0.028
	Yes	93	19		
	No	14	16		
Vaccination				1.131	0.288
	Yes	86	14		
	No	26	15		

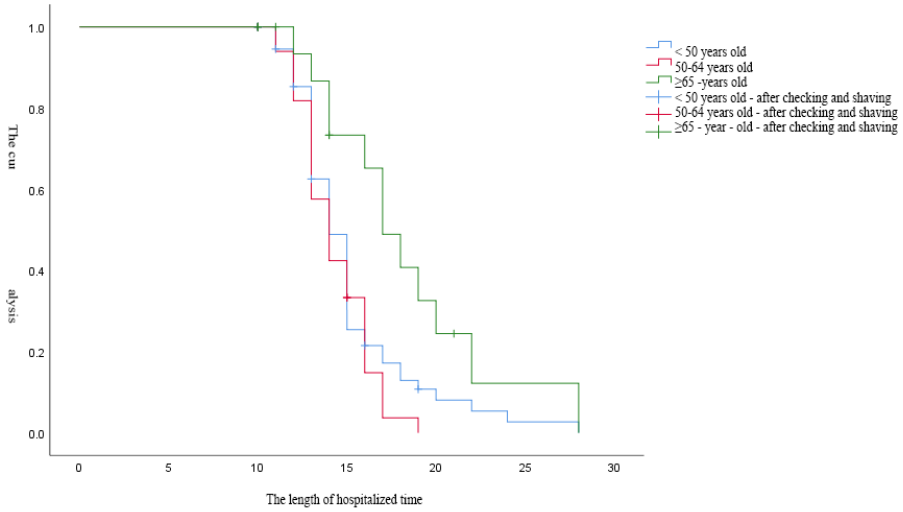

Figure 2. Effect of age on length of stay

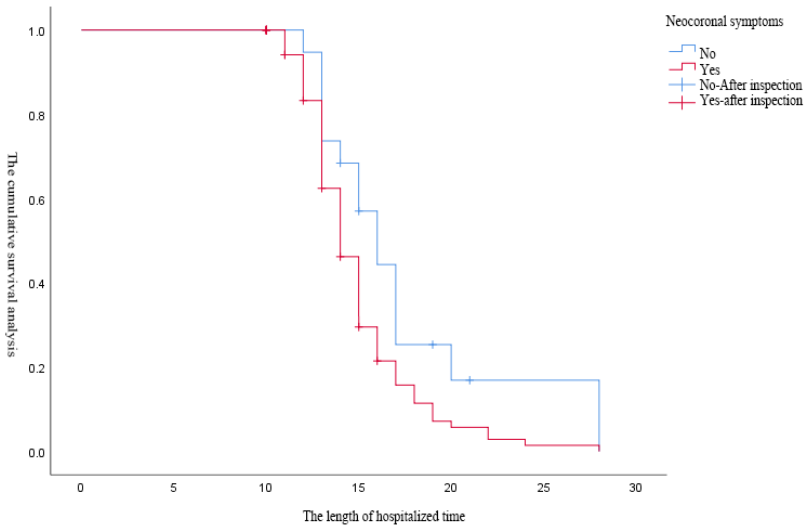

Figure 3. Effect of COVID-19 symptoms on length of stay

3.2. Cox multivariate analysis

All factors were included in Cox regression analysis. The results showed that age ($\chi^2 = 8.669$, $P = 0.006$) and new crown related symptoms ($\chi^2 = 5.424$, $P = 0.020$) were independent factors affecting the length of hospital stay. Compared with elderly patients aged ≥ 65 years, young and middle-aged patients aged < 65 years had a shorter hospital stay (HR = 0.450, 95% CI: 0.235-0.862), while asymptomatic patients had a

longer hospital stay than patients with COVID-19 related symptoms (HR= 1.965. 95%CI: 1.113-3.469) (As shown in **Table 2**).

Table 2. Multi factor analysis

Factor		β	SE	χ^2	p	HR	95% CI
Age				8.669	0.006		
	50-64 years old	0.260	0.233	1.239	0.266	1.297	0.821–2.049
	≥ 65 years old	-0.798	0.331	5.799	0.016	0.450	0.235–0.862
Neocoronal symptoms		0.675	0.290	5.424	0.020	1.965	1.113–3.469

4. Discussion

At present, the clinical manifestations of patients infected with Omicron strain are indeed significantly reduced compared to those infected with the previous several COVID-19 variants, but we cannot relax our vigilance. Novel coronavirus infection is a systemic disease, usually manifested in the lungs, but not limited to the lungs. The research published in BMJ (British Medical Journal) suggests that COVID-19 infection involves major organs including the heart, kidney, lung and brain [5]. Usually, three weeks after the onset of COVID-19 infection, 1/3 of the elderly infected people are still hospitalized due to the sequelae of COVID-19. More than 430 million people worldwide have been infected with novel coronavirus. The rehabilitation and treatment of patients with its sequelae will be a significant family and social burden in the future, and will bring a series of economic and social problems.

The transmissibility of the Omicron variant of the Shanghai epidemic is a major reason for the rapid spread of the epidemic. The variation of the virus evades the immune response to a certain extent, and in many types of vaccines, the weakening of antibody strength and the decline of protective effect have been reported. This led doctors to think about whether people who had previously received the "first" vaccination should further strengthen the vaccination. The University of Hong Kong carried out a study on neutralizing the Omicron variant with the serum of vaccinators [6], of which 25 were vaccinated with BNT162b2 vaccine and 25 were vaccinated with Keshing inactivated vaccine. The study found that the serum of inactivated vaccinators could not neutralize the Omicron variant, and only 5 (20%) of BNT162b2 vaccinators could neutralize it. On February 23, 2022, Mallapaty et al. [7] published an article on Nature that showed that the third dose of vaccination was very important. For young, healthy people without underlying diseases, the fourth dose of mRNA vaccination can improve antibody neutralization activity, but it provides little additional protection against novel coronavirus infection; for the elderly over 60 years old, it is still necessary to vaccinate the fourth dose of BNT162b2, which can significantly reduce the infection rate and severe disease rate of novel coronavirus [7]. It can be seen that although vaccination may not reduce the infection risk of Omicron mutant at present, it can still protect the population.

In this study, 110 patients were asymptomatic or mild patients in the Shelter Hospital of the National Exhibition Center. Their age and absence of COVID-19 related symptoms were positively correlated with the length of stay, but not with gender, smoking habits, vaccination status and basic diseases. The 110 patients did not need special treatment, but were treated with traditional Chinese medicine orally to enhance immunity. This also brings new thinking for future epidemic prevention policies, such as which groups should be given priority in future epidemic prevention, which groups should be isolated for long-term observation, whether the relevant factors can be used to screen people for isolation in makeshift hospitals in the future, and other groups should be isolated in communities, in order to avoid the waste of medical

resources and reduce the pressure of medical workers, which may also reduce the economic and social pressure, for the evaluation of medical load, rational use of medical resources, and also has practical significance. Patients without COVID-19 related symptoms will stay in hospital longer. Considering that the patient population is asymptomatic or patients with mild virus infection, the related symptoms may promote virus elimination, and it also suggest that in vivo immunity is clearing the virus. Compared with asymptomatic patients, symptomatic patients have faster virus metabolism and shorter course of disease. At the same time, the dissemination of these medical knowledge will also alleviate the panic and psychological pressure of large-scale patient groups. Due to the relatively short time for young patients to enter and leave the hospital, the surrounding long-term hospitalized people have a huge psychological burden. Research results show that COVID-19 patients with chronic obstructive pulmonary disease, hypertension, diabetes, malignant tumors and other complications have higher risk of admission to ICU and death than those without complications [8]. Therefore, we should not relax our vigilance for patients with basic diseases. Although basic diseases are not related to the length of hospital stay, whether a series of problems caused by virus infection will lead to the deterioration of basic diseases is the direction that still needs to be studied in the future.

Omicron mutant has caused huge epidemic prevention pressure in China, and has caused huge economic losses to Shanghai. We should also continue to understand its complete etiology, including viral infectivity, serum immune neutralization, effectiveness analysis of existing vaccines and immunotherapies, safety measures such as isolation, wearing masks, social distance, hand hygiene, and upgrading of medical facilities, so as to limit the transmission speed of Omicron variant before the advent of vaccines and drugs that are more effective against SARS-CoV-2 variant. We believe that under the leadership of the Party and the country, through continuous learning on the subject of epidemic prevention and control, China's epidemic prevention and control strategy will be more accurate in the future. We believe that with the joint efforts of people all over the world, the epidemic will definitely be overcome.

Disclosure statement

The authors declare no conflict of interest.

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