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Applicability of MuLBSTA scoring system as diagnostic and prognostic role in early warning of severe COVID-19

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ABSTRACT

To explore the applicability of MuLBSTA Score in COVID-19 patients, a retrospective analysis was performed on 330 cases of COVID-19 patients in Southeast Hospital of Xiaogan City, Hubei Province. The clinical characteristics of COVID-19 patients were described and multilobe infiltrate in CT, bacterial infection, lymphocyte count, smoking history, history of hypertension, and age distribution in the population of mild and severe patients were analyzed. All included patients were scored according to the MuLBSTA early warning scoring system and its efficacy in early warning of severe symptoms was analyzed. CT feature of infiltration changes on multiple lobes, the absolute value of lymphocyte count of less than 0.8×10^9/L, accompanied by bacterial infection, history of smoking, history of hypertension, and an age of greater than 60 years old were all statistically significant factors in patients with severe COVID-19. ROC curve analysis indicated that the sensitivity, specificity and accuracy of the early warning system were 0.651, 0.954 and 0.93, respectively. The MuLBSTA Score has a good early warning effect on severe COVID-19 patients.

1. Introduction

Since the first novel coronavirus (2019-nCoV) infection was found in Wuhan, China in December 1, 2019, it has become a worldwide infectious disease. Up to now, there are more than 2.9 million people infected and more than 260,000 people died in the world, which is regarded as a great threat to human health. 2019-nCoV is a single-stranded positive-sense RNA coronavirus with envelope. Its gene sequence and SARS Virus and Middle East Respiratory Syndrome Coronavirus belong to the same lineage but different branches [1]. Because 2019-nCoV virus is brand-new, the current clinical research is preliminary, and its diagnostic criteria, pathogenesis, disease characteristics are also preliminary. Seen from the existing studies [2], the early symptoms of COVID-19 were mild, and most of the critically ill patients admitted to ICU were elderly with underlying diseases, making up most of the dead patients. These patients were prone to severe pneumonia, acute respiratory distress syndrome (ARDS) or bacterial infection, and further develop to multiple organ failure, leading to death. A study of 138 patients with COVID-19 published on JAMA on February 8 [3] showed that 26% of patients needed to enter ICU and 4.3% died. All patients showed typical changes of viral pneumonia on chest CT. Since the novel coronavirus has no specific drugs so far, most mild cases can be self cured. The severe patients mainly show ARDS, respiratory failure, and relatively high mortality. The core of their treatment is early diagnosis and early supportive treatment.

The Multilobular infiltration, hypo-Lymphocytosis, Bacterial co-infection, Smoking history, hyper-Tension and Age (MuLBSTA) Score is a scoring system developed by Ruijin Hospital in 2019 [4]. Through retrospective analysis of 528 confirmed viral pneumonia, the demographic data, basic diseases, laboratory tests, immunological indicators, etiological tests and treatment were collected. Logistic regression analysis was used to predict 90 day mortality rate with weighted scoring. In total, the age ≥60 years old, smoking history, hypertension history, multilobed infiltration of imaging, lymphocyte count ≤0.8×10^9/L and bacterial infection were screened, and the score of 12 points was taken as the cutoff value of death risk stratification. It was calculated that the sensitivity of the model to the prediction of death from viral pneumonia was 0.776, and the specificity was 0.778, indicating the following risk categories: MuLBSTA 0–11 (low risk, mortality = 5.07%), MuLBSTA 12–22 (high risk, mortality = 33.92%). A high MuLBSTA score can be a good predictor of the prognosis of viral pneumonia. This score can help clinicians make appropriate decisions and
optimize the use of hospital resources.

A clinical study of 99 patients with COVID-19 published by Lancet on January 29, 2020 [5] showed that 2019-nCoV infection was more likely to affect elderly men with underlying diseases, and might cause ARDS. The low absolute value of lymphocyte can be used as a reference index for clinical diagnosis of 2019-nCoV infection. The study noted that MuLBSTA Score might be an early warning model for predicting the death of viral pneumonia. Zhong Nanshan’s team [6] analyzed the clinical data of COVID-19 patients in 552 hospitals in 31 provinces and cities across the country and found that the most common symptoms were fever and cough, and most of the severe patients presented with ground-glass opacity and bilateral patchy opacity on chest CT. Compared with the average mortality rate in China (2.01%), Guangdong Province had the lowest mortality rate (0.88%), which was considered to be related to early isolation, early diagnosis and early treatment strategies. According to the international guidelines, the study stratified the admission severity of ARDS patients with COVID-19, which was more conducive to the treatment of severe patients. In practical work, the severity of the disease, the results of laboratory examination and chest imaging examination should be considered. The study suggested that as an early warning model for predicting mortality of viral pneumonia, the applicability of the MuLBSTA Score in 2019-nCoV needed to be further confirmed. Screening and early diagnosis of severe COVID-19 patients are key to the treatment of present COVID-19 patients. The hospital where this study was conducted is the Southeast Hospital of Xiaogan City, Hubei Province, which was the diagnosis and treatment site for mild COVID-19 patients and responsible for the treatment of mild COVID-19 patients. At the same time, early identification and early transfer of severe patients were required to reduce the incidence and mortality of critical diseases. In this study, the MuLBSTA scoring system, an advanced early-warning model for death risk of viral pneumonia in China, was used to conduct a retrospective study on COVID-19 patients admitted to this hospital, so as to verify the applicability of the scoring system in the early warning of severe COVID-19, and to provide clinical evidence for the subsequent stratified diagnosis and treatment of COVID-19.

2. Methods and materials

2.1. Study design and population

From January 18, 2020 to March 22, 2020, a single center retrospective study was conducted in the Southeast Hospital of Xiaogan City, Hubei Province, China. The study was approved by Xiaogan Ethics Committee, and the written informed consent of all patients was obtained before enrollment. We retrospectively studied the results of multiple real-time reverse transcription polymerase chain reaction (RT-PCR, TiB respiratory kit, Roche) in all hospitalized patients with positive results. Inclusion criteria: COVID-19 patients conform to the diagnostic criteria for 2019-nCoV issued by the National Health Council; aged 18 or above; agreed to be included in the study. Exclusion criteria: only suspected or clinically diagnosed without RT-PCR and gene sequencing; asymptomatic infection; age <18 years old. According to the above criteria, 330 patients were included in this study. Diagnosis criteria of severe cases: respiratory distress, RR ≥ 30 times/min; in resting state, oxygen saturation ≤93%; arterial partial pressure of oxygen (PaO2)/fraction of inspiration (FiO2) ≤ 300 mmHg (1 mmHg = 0.133 kPa); respiratory failure, requiring mechanical ventilation; shock; other organ failure requiring ICU monitoring and treatment. In combination with the actual medical conditions of the hospital, the patients who meet the diagnosis criteria of severe cases would be transferred to the superior hospital for further treatment as soon as possible.

2.2. Data collection

For all confirmed patients with COVID-19, demographic data (age, gender, smoking history), basic diseases (hypertension, diabetes, asthma, COPD, heart failure, coronary heart disease, liver and kidney function diseases, cancer, etc.), initial clinical manifestations (fever, cough, fatigue, muscle pain, shortness of breath, etc.), chest CT examination, etc. were collected. All patients were scored according to the MuLBSTA (https://www.mdcalc.com/mulbsta-score-viral-pneumonia-mortality) early warning scoring system (see Table 1). They were divided into two groups according to their scores: group with MuLBSTA <12 and group with MuLBSTA ≥12. The outcome of each patient was recorded. The specificity and sensitivity evaluation of patients was verified early by the MuLBSTA scoring system; the true positive was defined as MuLBSTA ≥12 points, which was confirmed as severe or above 2019-nCoV cases by clinical follow-up; the false positive was MuLBSTA ≥12 points, which was not severe or above 2019-nCoV cases by clinical follow-up; the false negative was confirmed as severe or above NCP patients by clinical follow-up while MuLBSTA <12 points; the true negative was confirmed as not severe or above NCP patients by clinical follow-up with MuLBSTA <12 points.

2.3. Statistical analysis

Category variables were represented by %. If the continuous variables presented normal distribution, we expressed them as mean (SD). If continuous variables presented not normally distributed, we expressed them as median (quartile range, IQR). Chi-square test or Fisher test was used to compare the difference between severe group and mild group. Paired P < 0.05 suggested statistical significance. All data were analyzed by SPSS (version 26.0). ROC curve analysis was used to evaluate the prediction effect of severe patients with MuLBSTA score.

3. Results

3.1. Demographic characteristics

By March 21, 2020, 330 inpatients in Xiaogan Southeast Hospital were diagnosed as COVID-19. Among them, 160 were male patients (48.34%) and 170 were female patients (51.66%). The oldest patient was 87 years old, and 67 were under 39 years old (20.30%), 171 were between 40 and 59 years old (51.82%), 51 were between 60 and 69 years old (15.45%), 42 were over 70 years old (12.73%). In the severe group, as high as 41.38% of the patients were over 70 years old, while in the mild group, 53.83% of the patients were between 40 and 59 years old. See Table 2 for the number of mild and severe cases in other ages.

3.2. Initial clinical manifestations

Among the 330 patients with COVID-19, 1.52% of patients had asymptomatic infection, 23.3% had only one symptom of discomfort, and 75.45% had two or more symptoms. Among them, fever was the most common symptom, occurred in 80% of cases, other common symptoms were cough (61.52%), chest distress (30.30%), weakness (40.30%), poor appetite (15.45%), diarrhea (8.18%), and uncommon symptoms were nasal obstruction (3.94%), runny nose (4.85%), headache (2.42%), expectoration (21.21%), shortness of breath (1.52%), chills (6.06%), palpitations (9.09%), muscle soreness (9.09%), sore

| Items | Scores |
|-------|--------|
| multi-lobe infiltrate | 5 |
| lymphocyte count < 0.8×10^9/L | 4 |
| accompanied by bacterial infection | 4 |
| Smoking | acute-smoker |
| | quit-smoker |
| Hypertension | 2 |
| age > 60 years | 2 |
throat (6.06%), nausea (6.06%) and vomiting (3.03%). Among the 330 patients, the number that developed into severe cases was shown in Table 3.

3.3. Combined diseases

Nearly 30% of the patients suffered from other chronic basic diseases at the same time. The common diseases were hypertension in 18.48% of cases, diabetes in 3.94%, coronary heart disease in 2.42%, liver disease in 2.42%, and uncommon diseases were tuberculosis in 0.60%, chronic obstructive pulmonary disease, asthma and other lung diseases in 0.9%, thyroid dysfunction in 0.60%, etc. The specific number of combined diseases and incidence rate were listed in Table 4.

3.4. Analysis of specific items in the MuLBSTA scoring

According to evaluated items of MuLBSTA Score contained multilobe infiltrate, bacterial infection, lymphocyte count, smoking history, hypertension and age. Among the patients admitted to the hospital, 151 had multilobe infiltrate on chest CT, among them 27 developed into severe cases (accounting for 93.10% of the total number of severe). And 48 of the 330 patients (14.55%) had absolute lymphocyte count less than $0.8 \times 10^9$, including 22 developed into severe cases (accounting for 75.86% of the total number of severe). Combined with sputum

| Table 2 | Basic characteristics of population. |
|---------|-------------------------------------|
|         | Total (N = 330) | Severe group (N = 29) | Mild group (N = 301) |
| Male    | 160 (48.34%)    | 15 (51.72%)           | 145 (48.17%)          |
| Female  | 170 (51.66%)    | 14 (48.28%)           | 156 (51.83%)          |
| ≤39 years | 67 (20.30%)     | 1 (3.45%)             | 66 (21.93%)           |
| 40-59 years | 171 (51.82%)   | 9 (31.03%)            | 162 (53.83%)          |
| 60-69 years | 51 (15.45%)     | 7 (24.14%)            | 44 (14.62%)           |
| ≥70 years | 42 (12.73%)     | 12 (41.38%)           | 30 (9.97%)            |

| Table 3 | Distribution of initial clinical manifestations. |
|---------|------------------------------------------------|
|         | initial clinical manifestations Total (N=330) Severe group (N=29) Mild group (N=301) |
| Asymptomatic | 5 (1.52%) 0 5 (1.66%) |
| Single symptom | 76 (23.3%) 9 (31.03%) 67 (22.26%) |
| 2 or more symptoms | 249 (75.45%) 20 (68.97%) 229 (76.08%) |
| Fever | 264 (80.00%) 25 (86.20%) 241 (79.40%) |
| Cough | 203 (61.52%) 12 (41.38%) 191 (63.45%) |
| Chest distress | 100 (30.30%) 8 (27.59%) 92 (30.56%) |
| Weakness | 133 (40.30%) 15 (51.72%) 118 (39.20%) |
| Poor appetite | 51 (15.45%) 4 (13.79%) 47 (15.61%) |
| Diarrhea | 27 (8.18%) 2 (6.90%) 25 (8.31%) |
| Nasal congestion | 13 (3.94%) 0 13 (4.32%) |
| Runny nose | 16 (4.85%) 1 (3.45%) 16 (5.32%) |
| Headache | 8 (2.42%) 0 8 (2.66%) |
| Expectoration | 7 (21.21%) 5 (17.24%) 2 (0.66%) |
| Shortness of breath | 5 (1.52%) 0 5 (1.66%) |
| Chilly | 2 (0.60%) 0 2 (0.66%) |
| Palpitation | 3 (0.90%) 0 3 (1.00%) |
| Muscle soreness | 3 (0.90%) 0 3 (1.00%) |
| Sore throat | 2 (0.60%) 0 2 (0.66%) |
| Nausea | 2 (0.60%) 0 2 (0.66%) |
| Vomiting | 1 (3.03%) 0 1 (1.00%) |

| Table 4 | Distribution characteristics of combined diseases. |
|---------|------------------------------------------------|
|         | Complications | N (%) | Severe group (N = 29) | Mild group (N = 301) |
| Basic diseases | 98 (29.61%) 21 (72.41%) 77 (25.58%) |
| Hypertension | 61 (18.48%) 16 (55.17%) 45 (14.95%) |
| Diabetes | 13 (3.94%) 6 (20.69%) 7 (2.33%) |
| Coronary heart disease | 8 (2.42%) 2 (6.90%) 6 (1.99%) |
| Liver diseases | 8 (2.42%) 2 (6.90%) 6 (1.99%) |
| Fibroid | 3 (0.90%) 0 3 (1.00%) |
| Tuberculosis | 2 (0.60%) 1 (3.45%) 1 (0.33%) |
| Copd | 2 (0.60%) 0 2 (0.66%) |
| Stomach trouble | 2 (0.60%) 0 2 (0.66%) |
| Thyroid disease | 2 (0.60%) 0 2 (0.66%) |
| Gout | 2 (0.60%) 0 2 (0.66%) |
| Hysterectomy | 1 (0.30%) 0 1 (0.33%) |
| Renal calculus | 1 (0.30%) 0 1 (0.33%) |
| Cholelithiasis | 1 (0.30%) 0 1 (0.33%) |
| Meningioma | 1 (0.30%) 0 1 (0.33%) |
| Cerebral thrombosis | 1 (0.30%) 0 1 (0.33%) |
| Uremia | 1 (0.30%) 1 (3.45%) 0 |
| Asthma | 1 (0.30%) 0 1 (0.33%) |
| Lung cancer | 1 (0.30%) 1 (3.45%) 0 |
characteristics, white blood cell count, CRP, PCT and other indicators of the patients, a total of 5 patients were considered to have bacterial infection, 4 of whom were severe (accounting for 13.79% of the total number of severe cases). A total of 75 patients had a history of smoking, among whom 61 were acute smokers (18.48%) and 14 had quit smoking (4.24%). Among them 11 developed into severe cases (accounting for 37.93% of the total number of severe cases). The incidence of severe disease was statistically significant compared with those without smoking history. A total of 61 patients (18.48%) had previous history of hypertension, 16 of whom developed into severe (accounting for 55.17% of the total number of severe cases). The details and statistical analysis results were shown in Table 5.

### 3.5. Analysis of MuLBSTA scores

Based on the above data in combination with the scores corresponding to the specific item of MuLBSTA Score, the MuLBSTA scores of each patient were calculated and stratified with a cut-off point of 12 (Table 6). Among the 330 patients, 307 (93.03%) had a score lower than 12 points, of whom 14 developed into severe (accounting for 48.27% of the total number of severe cases). The false negative rate was 4.56% (14/307), 293 had mild symptoms, and the true negative rate was 95.44% (293/307). 23 (6.97%) cases had a score greater than or equal to 12 points, and 15 developed into severe (accounting for 51.72% of the total number of severe cases). The true positive rate was 65.12% (15/23) and the false positive rate was 34.78% (8/23). The ROC curve was used to analyze the MuLBSTA score for the prediction effect of severe patients and the results were statistically evaluated (see Fig. 1 for details). The results indicated that the area under the curve (AUROC = 0.927) and the upper and lower 95% confidence intervals were 0.963 and 0.892, respectively. After calculation, the sensitivity, specificity and accuracy of the system were 0.651, 0.954 and 0.93 respectively. In conclusion, it was suggested that the MuLBSTA early warning system had a good early warning effect on severe 2019-nCoV patients.

### 4. Discussion

This paper is a review of the epidemiological and clinical characteristics of COVID-19 patients admitted to Xiaogan Southeast Hospital in Hubei Province, and the MuLBSTA scoring system developed by Ruijin Hospital was used to study its applicability for the early warning of severe COVID-19. A study of 99 patients in Wuhan [5] found that male patients were more than female patients, considering that the reduction of female susceptibility to viral infection was attributed to the protection of X chromosome and sex hormones, as they played an important role in innate and adaptive immunity. However, among the 330 patients with COVID-19 infection in this study, males were less than females, so the difference of gender factors in COVID-19 patients’ susceptibility may need to be further studied. In this study, about 60% of the patients were between 40 and 59 years old. However, in the total number of patients with severe illness, about half of them were above 60 years old, suggesting that advanced age (>60 years old) might be one of the risk factors for severe COVID-19 development. In this study, approximately 30% of the patients were complicated with other chronic basic diseases, mainly cardiovascular and cerebrovascular diseases and diabetes. The heart and blood vessel walls, like the nose and alveoli, are also rich in ACE2 receptors, which may be attacked directly by the viruses, or blood vessels may be damaged due to hypoxia caused by impaired lung function, and the heart may be damaged by excessive immune factors [7]. This may explain why patients with a history of chronic diseases such as diabetes, hypertension and other vascular damage have a higher risk of serious disease. Similar to MERS-CoV, because these patients have weaker immune function.

Among the initial clinical manifestations, fever was the most common symptom, and other common symptoms were cough, chest distress, weakness, poor appetite, diarrhea and so on. Researchers at the Wellcome Sanger Institute found that [7] the nasal cavity was rich in receptors for SARS-CoV-2: the angiotensin-converting enzyme 2 (ACE2). The virus was recognized by the receptor and entered the cells for mass reproduction. Patients might have non-specific symptoms such as fever, cough, sore throat, loss of sense of smell and taste or headache and body pain.

If the patient’s autoimmunity is unable to resist SARS-CoV-2, then the virus will travel along the trachea, and the leukocytes in the front line of the immune system will release inflammatory molecules, at the same time call the immune cells to target and kill the cells infected by the virus, inducing the cytokine storm in vivo, producing a series of immune responses, and causing the changes of peripheral blood leukocytes and lymphocytes and other immune cells. Some patients have acute respiratory distress syndrome (ARDS) and septic shock develop rapidly and eventually progress into multi-organ failure. A large decrease in lymphocyte count indicates that the coronaviruses consume many immune cells and inhibit the cellular immune function of the human body. Previous studies [8] suggested that when PO2/FiO2 < 250 or peripheral blood lymphocyte count < 0.8 × 10^9/L, clinicians should attach great importance to the possibility of severe influenza pneumonia. In this retrospective study, about 14.55% of the patients had decreased absolute value of lymphocyte (<0.8 × 10^9/L), of whom about one half developed into severe cases. Lymphocyte injury may be an important cause and specific manifestation of the aggravation of patients with COVID-19. The low absolute value of lymphocytes can be used as an important reference index for clinical diagnosis of patients with COVID-19 develop into severe cases. There is study showing that [9] multi-lobular infection on chest CT was also a significant factor in COVID-19. In this study, 93% of the patients with severe COVID-19 were complicated with multi-lobular infection, which further indicated that multi-lobular infection on chest CT was an important risk factor of severe infection.

MuLBSTA Score is a scoring system developed by Ruijin Hospital in 2019. In total, age ≥60 years old, smoking history, hypertension history, imaging showing multi-lobe infiltration, lymphocyte count <0.8 × 10^9/L and bacterial infection were screened as indexes. MuLBSTA score of 12–22 was set as high risk of death. In general, the characteristics of severe patients in this study are in line with the system score, and the six indicators in this study are all risk factors for the progression of severe patients. All patients were scored by this system. Patients with more than 12 scores developed into severe cases. Compared with patients with less than 12 scores, the difference was statistically significant. The area

### Table 5

| Indicator                  | Total (N = 330) | Severe group (N = 29) | Mild group (N = 301) | Odds Ratio (95% CI) | P value |
|----------------------------|-----------------|-----------------------|----------------------|---------------------|---------|
| Multilobe infiltrate       | 152 (46.06%)    | 27 (93.10%)           | 125 (41.53%)         | 0.053 (0.01–0.23)   | < 0.0001 |
| Lymphocyte < 0.8 × 10^9/L  | 48 (14.55%)     | 22 (75.86%)           | 26 (8.64%)           | 0.030 (0.01–0.08)   | < 0.0001 |
| Bacterial infection        | 5 (1.52%)       | 4 (13.79%)            | 1 (0.33%)            | 48                  | 0.0002  |
| smoking history            |                 |                       |                      |                     |         |
| Acute-smoker               | 61 (18.48%)     | 10 (34.48%)           | 51 (16.94%)          | 0.4419 (0.20–0.98)  | 0.0408  |
| Quit-smoker                | 14 (4.24%)      | 1 (3.45%)             | 13 (4.32)            |                     |         |
| Hypertension               | 61 (18.48%)     | 16 (55.17%)           | 45 (14.95%)          | 7.002 (3.15–15.56)  | < 0.0001 |
| > 60 years                 | 93 (28.18%)     | 19 (65.51%)           | 74 (24.58%)          | 5.828 (2.60–13.10)  | < 0.0001 |

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under the curve (AUROC = 0.927) was used to analyze the prediction effect of MuLBSTA score on severe patients and statistical evaluation was made. The sensitivity, specificity and accuracy of the MuLBSTA warning system were 0.651, 0.954 and 0.93, indicating that the MuLBSTA warning system had a good early warning effect on severe patients with 2019-nCoV. MuLBSTA score above or equal to 12 can be used as a good early warning index for severe COVID-19. It is helpful for clinicians to make appropriate decisions and optimize the use of hospital resources as soon as possible. However, concerns should be addressed that days from the onset of symptoms to hospital admission may be relatively long. Patients with mild symptoms spend longer time at home than patients with severe symptoms, which introduces selection bias and leads to differences in MuLBSTA scores. In addition, we observed relative high false positive rate in population with MuLBSTA scores higher than 12 points compared to these lower than 12 points. Improvements are needed to eliminate this bias in the future studies.

To sum up, this retrospective study shows that the MuLBSTA early warning system is simple and easy to operate, and has a good correlation with the severity of COVID-19. It is expected that further large-scale case studies will be made to verify its applicability to the early warning of severe cases, so as to provide strong support for the follow-up anti epidemic work.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

[1] R. Lu, X. Zhao, J. Li, P. Niu, B. Yang, H. Wu, et al., Genomic characterisation and epidemiology of 2019 novel coronavirus: implications for virus origins and receptor binding, Lancet 22 (395) (2020) 565–574.
[2] Epidemiological and Clinical Features of 197 Patients Infected with 2019 Novel Coronavirus in Chongqing, China: a Single Center Descriptive Study. 2019.
[3] D. Wang, B. Hu, C. Hu, F. Zhu, X. Liu, J. Zhang, et al., Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus–infected pneumonia in Wuhan, China, J. Am. Med. Assoc. 17 (322) (2020) 1061–1069.
[4] L. Guo, D. Wei, X. Zhang, Y. Wu, Q. Li, M. Zhou, et al., Clinical features predicting mortality risk in patients with viral pneumonia: the MuLBSTA score, Front. Microbiol. 10 (2019) 2752.
[5] N. Chen, Z. Zhou, X. Dong, J. Qu, F. Gong, Y. Han, Y. Qiu, J. Wang, Y. Liu, Y. Wei, T. Yu, Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study, Lancet 395 (10223) (2020) 507–513.
[6] W. Guan, Z. Ni, Y. Hu, W-H. Liang, C-L. Ou, J-Y. He, et al., Clinical characteristics of 2019 novel coronavirus infection in China, medRxiv (2020), 2020.02.06.20020974.
[7] J.C. Meredith Wadman, K. Jocelyn, M. Catherine, How does coronavirus kill? Clinicians trace a ferocious rampage through the body, from brain to toes, Sci. Mag. (2020).
[8] Shi Shu Jing, Li Hui, Meng Liu, et al., Mortality prediction to hospitalized patients with influenza pneumonia: PO2/FiO2 combined lymphocyte count is the answer, Clin. Res. J 11 (3) (2017 May) 352–360.
[9] L.C. Jennings 1, T.P. Anderson, K.A. Beynon, et al., Incidence and characteristics of viral community-acquired pneumonia in adults, Thorax 63 (1) (2008 Jan) 42–48.