Original Research Article

# Prognostic Accuracy of News 2 in Geriatric Patients with COVID-19 in a Tertiary Care Hospital

**Shailaja. V. Rao[1], Momin Aaisha Heena[2], Mangala Sonavani-Borkar[3], Mahesh Patil[4], Shaikh Zeba Firdous[5], Smita Andurkar[6]**

[1]Associate Professor, Department of Geriatrics, Government Medical College, Aurangabad
[2]Junior Resident 3rd Year, Department of Geriatrics, Government Medical College, Aurangabad
[3]Professor, Department of Geriatrics, Government Medical College, Aurangabad
[4]Assistant Professor, Department of Geriatrics, Government Medical College, Aurangabad
[5]Senior Resident, Department of Geriatrics, Government Medical College, Aurangabad
[6]Associate Professor, Department of Community Medicine, Government Medical College, Aurangabad

**Abstract**

**Introduction:** COVID-19 is a widespread disease having more impact on elderly as compared to younger age group. [2] Although many parameters have emerged as predictors of prognosis of COVID-19, a simple clinical score at baseline can be used for early risk stratification. NEWS2 (National Early Warning Score) is one such scoring system which was originally developed to improve detection of deterioration in acutely ill patients.[8] Therefore, the present study has been conducted to assess the effectiveness of NEWS2 in predicting critical outcomes and mortality in geriatric patients with COVID-19.

**Materials and Methods:** A cross sectional Observational study was done on 200 Geriatric patients hospitalised with confirmed COVID-19 between December 2020 to November 2022. Baseline NEWS2 score was calculated. The sensitivity, specificity, Positive Predictive Value and Negative Predictive Value were established for NEWS2 score of 5 or above.

**Results:** In critical group, all 109 (100%) patients' deterioration was predicted, and in non-critical group, in 14 (15.4%) patients non deterioration was predicted while 77 (84.6%) patients' deterioration was predicted. Statistically significant association has been observed between the critical, non-critical groups and NEWS2 scale (P=0.001). Deterioration was predicted by NEWS2 scale in all the critical patients.

**Conclusion:** NEWS2 score of 5 or more on admission predicts poor prognosis in geriatric patients with COVID-19 with good sensitivity and it can easily be applied for risk stratification at baseline. We recommend further studies in the Indian setting to validate this simple score and use it further in Geriatric patients with COVID-19.

**Keywords:** NEWS2 (New early warning score), Geriatrics, COVID-19, Mortality.

## Introduction

COVID-19 has been a disease with global concern considering its morbidity and mortality [1] Till date, more than 663640386 patient have been infected, with a mortality of more than 6713093 people worldwide. Counts in India being more than 44681650 confirmed cases with the deaths of 530728 patients. [2] The annual growth of the geriatric population ( aged 60 and above) in India is higher than the rate of growth of the total population. According to the national census 2011, there are 104 million geriatric persons (age 60 and above) in India. [10] Geriatric population is more susceptible to a variety of diseases than younger, including COVID-19 infection, which could increase the healthcare cost exponentially [11]. Increasing age is the most important predictor for fatal outcomes.[12] With Increasing age, phenomenon of Immunosenescence is observed, which leads to disruption of both innate and adaptive arms of the immune system.

Also ,the elderly exhibits 'inflammaging.' a continual production of inflammatory mediators and cytokines. [12] Furthermore, ciliary dysfunction and anomalies that characterize aging may have an effect on a clearance of virus SARS-CoV-2 debris in older adults. [12]

In a pandemic like COVID-19, rapid assessment of patients is essential. Various scoring systems for detecting potentially critically ill patients in acute settings have been proposed and used in the emergency department. NATIONAL EARLY WARNING 2 (NEWS2), is one such score that might be used as a risk prediction tool for patients infected with COVID-19. [14] NEWS2 is a validated clinical scoring system which has been used to detection of deterioration in acutely ill patients [8]. It includes scoring of six physiological parameters; respiratory rate, oxygen saturation, systolic blood pressure, pulse rate, body temperature and level of consciousness or new confusion. In addition, factors are introduced for patients requiring supplementary oxygen treatment. A NEWS2 score of 5 or more is considered a threshold that may indicate clinical deterioration and should give an immediate response by a treating physician in the assessment and treatment of acutely ill patients [8]. Despite extensive research to search for a treatment for this deadly virus, no effective drug or therapeutic option could be found. Thus, early recognition of critical patients and patients predisposed to unfavourable outcomes is a cornerstone in the managing COVID-19, especially in an older people who are prone to unfavourable outcomes owing to lifetime accumulation of comorbidities. Early prediction of critical outcomes and aggressive management in elderly patients, using this NEWS2 can go a long way in reducing morbidity and mortality in the aging population. There is a big gap in the literature due to scarcity of such studies involving the elderly population. Therefore, the current study has been conducted to know the efficiency of NEWS2 in predicting critical outcomes and mortality in geriatric patients with COVID-19.

## Materials and Methods

**Study Design:** Cross Sectional Observational Study

**Study population:** 200 geriatric patients hospitalised with COVID 19 infection

Duration: Between December 2020 to **November 2022**

**Study centre:** Dedicated COVID care facility

**Inclusion criteria:** Geriatric inpatients suffering from COVID-19, diagnosis being confirmed by detection of SARS-CoV-2 by RT-PCR/RAT (Rapid Antigen Test). Following written informed consent, history and examination finding were recorded using standard questionnaire. Patients were followed up upto death or discharge. The NEWS2 score was

calculated on admission using the following parameters: Age, respiratory rate, oxygen saturation at room air (SpO2), need for supplemental oxygen, pulse rate, systolic BP, level of consciousness and temperature. A NEWS2 score of 5 or more was considered a threshold that may indicate deterioration [9].

### NEWS2: National Early Warning Score 2. ( Scoring system)

| Parameters | 3 | 2 | 1 | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|
| Age | | | | <60 | | | >60 |
| Respiratory Rate | <8 | | 9-11 | 12-20 | | 21-24 | >25 |
| Oxygen Saturation | <91 | 92-93 | 94-95 | >96 | | | |
| Supplemental Oxygen | | Yes | | no | | | |
| Systolic blood pressure | <90 | 91-100 | 101-110 | 111-200 | | | >200 |
| Heart rate | <40 | | 41-50 | 51-90 | 91-110 | 111-130 | >131 |
| Consciousness | | | | Alert | | | Drowsy, lethargy, coma Confusion |
| Temperature | <35 | | 35.1-35 | 36.1-38 | 38.1-39 | >39 | |

As part of routine COVID 19 care, baseline laboratory investigations were also done.

Critical outcomes were defined as Intensive Care Unit requirement or death. Critical patients were defined as patients with the critical outcomes like Acute Respiratory Distress Syndrome (ARDS) and Septic Shock. Berlin Criteria was used to define Acute respiratory distress syndrome (ARDS).[14]

Septic shock was defined according to the Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3).15 Which states Septic Shock as persisting hypotension despite volume resuscitation, requiring vasopressors to maintain MAP .

The sensitivity, specificity, positive and negative predictive values with 95% confidence intervals (CIs) of NEWS2 score at admission in predicting critical outcomes and mortality were assessed. Cut off score of 5 or more for the NEWS2 score were used for these calculations.

Data so obtained was entered in Microsoft excel sheet and subjected to statistical analysis. For calculating the P values, Statistical Software SPSS Version 22.0.0.0 was used. Comparison of means between the groups was done using Unpaired 't' test, association between two non-parametric variables was done using Pearson Chi-square test. Fisher's Exact test was used for proportional comparison . Descriptive statistics were entered in the form of numbers and percentages. A p value of <0.05 was considered as statistically significant.

## Observation and Results

| S. No. | Variable | Critical group | Noncritical group | P value * |
|---|---|---|---|---|
| 1. | Age Distribution 60-70 years 71-80 years 81-90 years >90 years Total | 68 32 9 0 109 | 59 28 2 2 91 | 0.918 |
| 2. | Sex | | | |

| | | | | |
|---|---|---|---|---|
| | Males | 46 | 44 | |
| | Females | 63 | 47 | |
| | Total | 190 | 91 | 0.384 |
| 3. | Presenting complaints Breathlessness | | | |
| | Fever | 102 | 56 | |
| | Cough | 76 | 60 | |
| | Body ache | 66 | 66 | - |
| | Other complaints | 7 | 4 | |
| | Total | 23 | 36 | |
| 4. | Co morbidities | | | |
| | Hypertension | 48 | 42 | |
| | ischemic heart disease | 25 | 12 | |
| | Diabetes mellitus | 21 | 27 | |
| | Hypothyroidism | 3 | 1 | |
| | COPD | 2 | 9 | |
| | Chronic kidney disease | 2 | 0 | |
| | Cerebrovascular accident | 2 | 1 | |
| | Old PTB / TB | 2 | 0 | - |
| | Breast carcinoma | 1 | 0 | |
| | Myasthenia gravis | 1 | 0 | |
| | Asthma | 0 | 2 | |
| | Carcinoma larynx | 0 | 1 | |
| 5. | Spo2 at admission | | | |
| | <90% | 100 | 37 | |
| | 90-94 | 3 | 19 | |
| | >=95% | 1 | 33 | |
| | Total | 104 | 89 | 0.001* |
| 6. | Complications | | | |
| | ARDS | 100 | 0 | 0.001* |
| | ARF | 38 | 19 | 0.021* |
| | Shock | 22 | 0 | 0.001* |
| | Sepsis | 54 | 8 | 0.001* |
| 7. | NEWS2 SCORE | | | |
| | <5 | 0 | 14 | |
| | >=5 | 109 | 77 | |
| | Total | 109 | 91 | 0.001* |
| 8. | DISCHARGE | 17 | 90 | Not significant |
| | DEATH | 92 | 1 | |

* denotes significant association

**Table 1: Comparison of deterioration using NEWS2 scale.**

| NEWS2 Scale | Critical | | Non-critical | |
|---|---|---|---|---|
| | Number (No.) | Percentage (%) | Number (No.) | Percentage (%) |
| <5 | 0 | 0.0 | 14 | 15.4 |
| >=5 | 109 | 100.0 | 77 | 84.6 |
| Total | 109 | 100.0 | 89 | 100.0 |

Using Pearson Chi-square test. Chi-square value = 18.031, df=1, P value=0.001, Significant

The above table depicts the comparison of deterioration using NEWS2 scale.

In critical group, all 109 (100%) patients' deterioration was predicted, and in non-critical group, in 14 (15.4%) patients non deterioration was predicted while 77(84.6%) patients deterioration was predicted.

A statistically significant association has been found between the groups and NEWS2 scale (P=0.001)

Deterioration was predicted by NEWS2 scale in all the critical patients.

**Table 2: Sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of NEWS2 against actual criticality**

|  |  | Criticality | | Total |
| --- | --- | --- | --- | --- |
|  |  | Non-Critical | Critical | |
| NEWS2 | <5 | 14 | 0 | 14 |
|  | >=5 | 77 | 109 | 186 |
| Total |  | 91 | 109 | 200 |

The above table shows the sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy of NEWS2 against actual criticality.

**Sensitivity:** 100%

**Specificity:** 15.38%

**Positive predictive value:** 58.60%

**Negative predictive value:** 100.00%

**Diagnostic accuracy:** 61.50%

The NEWS2 has an excellent sensitivity (100%), but fair positive predictive value (58.6%). This test can be used for screening of early deterioration, but cannot be used as a confirmatory tool for early deterioration.

It has a very low specificity (15.38%), but an excellent negative predictive value (100%). The false positive rate is very high.

The overall diagnostic accuracy of the test is 61.5%.

NEWS2 cannot be used as an independent predictor of severity of the criticality.

**Table 3: Sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of NEWS2 against actual outcome**

|  |  | Outcome | |  |
| --- | --- | --- | --- | --- |
|  |  | Survived | Non survived | Total |
| NEWS2 | <5 | 14 | 0 | 14 |
|  | >=5 | 93 | 93 | 186 |
| Total |  | 107 | 93 | 200 |

The above table mentions the sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of NEWS2 against actual death outcome.

**Sensitivity:** 100%

**Specificity:** 13.08%

**Positive predictive value:** 50.00%

**Negative predictive value:** 100.00%

**Diagnostic accuracy:** 53.50%

The NEWS2 has an excellent sensitivity (100%), but fair positive predictive value (50%). This test can be used for screening of early deterioration, but cannot be used as a confirmatory tool for early deterioration.

It has a low specificity (13.08%), but an excellent negative predictive value (100%). The false positive rate is very high.

NEWS2 cannot be used as an independent predictor of severity.

Mean age of critical patients was 69.23 ± 7.62 and that of non-critical patients was 69.12 ± 7.16. In the critical group, breathlessness was seen in 102 patients, (93.6%), which is the most common clinical presentation, followed by fever. Hypertension, diabetes mellitus and COPD were the most common comorbidities seen in our study.

Sensitivity and specificity of NEWS 2 of 5 or more in predicting critical outcomes was 100% and 15.38% respectively. Age, pulse rate, oxygen saturation, need for supplemental oxygen and ARDS were independently associated with poor outcomes.

The prevalence of complications was significantly higher in critical patients, in comparison to the non-critical patients.

## Discussion

Findings from our study have concluded that, NEWS2 has an excellent sensitivity (100%), but fair positive predictive value (58.6%). This test can be used for screening of early deterioration. It has a very low specificity (15.38%), but an excellent negative predictive value (100%). The false positive rate is very high. The overall diagnostic accuracy of the test is 61.5%. NEWS2 cannot be used as an independent predictor of severity or criticality.

Prior to the pandemic, NEWS2 score has been used in the UK and many other countries for differentiate and monitoring of hospitalised patients. Only NEWS score was used in 2012 which was later modified in 2017 to NEWS2 by including confusion and oxygen saturation [14]. As COVID 19 started to spread, the Royal College of Physicians UK issued guidance advocating use of NEWS2 score for managing patients with COVID-19 [15]. However, it lacked existing evidence[9].

In search of evidence in patients with COVID 19, Myrstad and colleagues undertook a study to assess the ability of NEWS2 score at emergency room admission to predict poor prognosis and death [16]. They found that NEWS2 score of 6 or more had 84% specificity and 80% sensitivity in predicting severe disease, with an area under the curve (AUC) of 0.82. The said study has limitations of small sample size (66 patients), data being collected retrospectively for variables like comorbidities. Similar finding have been obtained from another small retrospective study from Italy which showed NEWS2 score at admission to be a good predictor of critical outcomes. (AUC of 0.90; 95% CI 0.82–0.97) [17].

Results of our study show similar findings to that of a single centred retrospective study done in UK on 296 hospitalised patients with COVID-19, which found that NEWS2 score of 5 or more anytime during stay predicted deterioration with a sensitivity and specificity of 0.98 (95% CI 0.96–1.00) and 0.28 (95% CI 0.21– 0.35) respectively [20]. Another study that evaluated performance of NEWS and NEWS2 scores among five admission cohorts also showed good discrimination for death or ICU admission within 24 hours for patients with COVID-19 [21].

## Conclusion

NEWS2 score of 5 or more at the time of admission predicts critical outcomes and mortality in geriatric patients with COVID-19 with very good sensitivity and can be used for risk stratification at baseline and need of early aggressive management.

However, it is neither specific not confirmatory. Similar inferences are for prediction of mortality in elderly. Using the results of this study as preliminary data, further clinical trials with larger cohorts of geriatric patients are needed in future.

## References

1. Zhou F, Yu T, Du R, Fan G, Liu Y, Liu Z, Xiang J, Wang Y, Song B, Gu X, Guan L. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a

retrospective cohort study. The lancet. 2020 Mar 28;395(10229):1054-62.

2. World Health Organization. WHO Coronavirus (COVID-19) Dashboard. Updated 21 January 2023. Accessed November 23, 2021. http://covid19.who.int] who dash board.

3. Richardson S, Hirsch JS, Narasimhan M, Crawford JM, McGinn T, Davidson KW, Barnaby DP, Becker LB, Chelico JD, Cohen SL, Cookingham J. Presenting characteristics, comorbidities, and outcomes among 5700 patients hospitalized with COVID-19 in the New York City area. Jama. 2020 May 26;323(20):2052-9.

4. Zhou F, Yu T, Du R, Fan G, Liu Y, Liu Z, Xiang J, Wang Y, Song B, Gu X, Guan L. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. The lancet. 2020 Mar 28;395(10229):1054-62.

5. Wang D, Hu B, Hu C, Zhu F, Liu X, Zhang J, Wang B, Xiang H, Cheng Z, Xiong Y, Zhao Y. Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus–infected pneumonia in Wuhan, China. jama. 2020 Mar 17;323(11):1061-9.

6. Guan WJ, Ni ZY, Hu Y, Liang WH, Ou CQ, He JX, Liu L, Shan H, Lei CL, Hui DS, Du B. Clinical characteristics of coronavirus disease 2019 in China. New England journal of medicine. 2020 Apr 30;382(18):1708-20.

7. Ruan Q, Yang K, Wang W, Jiang L, Song J. Clinical predictors of mortality due to COVID-19 based on an analysis of data of 150 patients from Wuhan, China. Intensive care medicine. 2020 May;46(5):846-8.

8. London RC. National early warning score (NEWS) 2 [Internet]. 2017 [cited 2020 Aug 8]. Available from: https://www.rcplondon.ac.uk/projects/outputs/national-early-warning-score-news-2.

9. NEWS (or NEWS2) score when assessing possible COVID-19 patients in primary care? [Internet]. CEBM. [cited 2020 Aug 8]. Available from: https://www.cebm.net/covid19/should-we-use-the-news-ornews2-score-when-assessing-patients-with-possible-covid-19-in-primary-care/.

10. Liao Y, Xu B, Wang J, Liu X. A new method for assessing the risk of infectious disease outbreak. Scientific reports. 2017 Jan 9;7(1):1-2.

11. Grubaugh ND, Ladner JT, Lemey P, Pybus OG, Rambaut A, Holmes EC, Andersen KG. Tracking virus outbreaks in the twenty-first century. Nature microbiology. 2019 Jan;4(1):10-9.

12. Goenka A, Liu L. Infectious diseases, human capital and economic growth. Economic Theory. 2020 Jul;70:1-47.

13. Corona virus (Covid-19) "infodemic" and emerging issues through a data lens: The case of china.

14. McCloskey B, Heymann DL. SARS to novel coronavirus–old lessons and new lessons. Epidemiology & Infection. 2020;148.

15. Nkengasong J. China's response to a novel coronavirus stands in stark contrast to the 2002 SARS outbreak response. Nature medicine. 2020 Mar 1;26(3):310-1.

16. Wang C, Horby PW, Hayden FG, Gao GF. A novel coronavirus outbreak of global health concern. The lancet. 2020 Feb 15;395(10223):470-3.

17. Zhou M, Zhang X, Qu J. Coronavirus disease 2019 (COVID-19): a clinical update. Frontiers of medicine. 2020 Apr;14:126-35.

18. Jiang S, Xia S, Ying T, Lu L. A novel coronavirus (2019-nCoV) causing pneumonia-associated respiratory syndrome. Cellular & molecular immunology. 2020 May;17(5):554-.

19. Yang P, Wang X. COVID-19: a new challenge for human beings. Cellular & molecular immunology. 2020 May;17(5):555-7.

20. Van Der Hoek L, Pyrc K, Jebbink MF, Vermeulen-Oost W, Berkhout RJ, Wolthers KC, Wertheim-van Dillen PM, Kaandorp J, Spaargaren J, Berkhout B. Identification of a new human coronavirus. Nature medicine. 2004 Apr 1;10(4):368-73.

21. Cui J, Li F, Shi ZL. Origin and evolution of pathogenic coronaviruses. Nature reviews microbiology. 2019 Mar; 17(3):181-92.