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Letter to the Editor

# A proposed ABCD scoring system for better triage of patients with COVID-19: Use of clinical features and radiopathological findings



## A B S T R A C T

**Keywords:**

ABCD Score  
 COVID-19 scoring system  
 Triage score  
 Corona disease score

**Background and aims:** Currently there are limited tools available for triage of patients with COVID -19. We propose a new ABCD scoring system for patients who have been tested positive for COVID-19.

**Methods:** The ABCD score is for patients who have been tested positive for COVID-19 and admitted in a hospital. This score includes age of the patient, blood tests included leukopenia, lymphocytopenia, CRP level, LDH level, D-Dimer, Chest radiograph and CT Scan, Comorbidities and Dyspnea.

**Results:** The triage score had letters from alphabets which included A, B, C, D. The score was developed using these variables which outputs a value from 0 to 1. We had used the code according to traffic signal system; green(mild), yellow moderate) and red(severe). The suggestions for mild (green)category: symptomatic treatment in ward, in moderate (yellow) category: active treatment, semi critical care and oxygen supplementation, in severe (red) category: critical care and intensive care.

**Conclusions:** This study is, to our knowledge, is the first scoring tool that has been prepared by Indian health care professional's and used alphabets A, B,C,D as variables for evaluation of admitted patients with COVID-19. This triage tool will be helpful in better management of patients with COVID-19. This score component includes clinical and radiopathological findings. A multi-centre study is required to validate all available scoring systems.

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## 1. Background

COVID -19 is a global pandemic and has affected all the countries across the globe [1,2].

Nandy et al. and Salunke et al. had described higher morbidity and mortality rate inflicted by COVID-19 among patient with medical comorbidity including cancer [1,2]. Currently only symptomatic treatment and intensive care have been used for seriously ill patients.

The review of literature leads to various score to assess the severity of disease or mortality risk or complication risk in patients with COVID-19 infection [3–8]. A score will help in evaluation of patients in a systematic method and is helping in communication between various centers regarding different outcomes. These score may also help in developing various treatment strategies and divide patients into subgroups for proper use of medical resources in their management.

We propose a new ABCD scoring system for patients who have been tested positive for COVID-19.

## 2. Methods

This tool is for patient assessment at a COVID-19 hospital after he has been tested positive for corona virus infection. We propose a “ABCD Score” which can be useful to establish a scoring system to identify people at risk of developing severe

events and used as a triage tool (Fig. 1) In this score we have included age of patient (<50years and >50 years), blood tests included leukopenia, lymphocytopenia, CRP level, LDH level, D-Dimer, Chest radiograph and CT Scan, Comorbidities and Dyspnea (Fig. 1).

## 3. Results

The risk score was developed using these variables which outputs a value from 0 to 1. The maximum score was 14 and minimum score of 0. Higher score indicates increased severity and demands for intensive care. The score was further categorized into 3 groups as 0–4, 4–8 and >8. We had used the color according to traffic signal system; green(mild), yellow moderate) and red(-severe). The suggestion for mild category (treat symptomatically), in moderate category (semi critical care) and in severe category (critical care) (Fig. 2). We have prepared a pyramid with a green standing person indicating symptomatic treatment, yellow walking person indicating active treatment and a red person on wheel chair indicating critical care.

## 4. Discussion

We have used alphabets A,B,C,D as variables for evaluation of admitted patients with COVID-19 for triage of patients with COVID-19. In current score we have utilized a chest radiograph

**ABCD Scoring system during treatment at hospital for patient with COVID-19**

Patient Name:  
Age and Gender:

Study Variable	Values	Score	
		0	1
Age (Years)	Young, Elderly	0-50	>50
Blood test	Leucopenia	No	Yes
	Lymphocytes (<1500 per mm <sup>3</sup> )	No	Yes
	CRP (>10 mg/L)	No	Yes
	LDH(>250U/L)	No	Yes
Chest X-ray or CT	D dimer(>0.5 mg/L)	No	Yes
	Ground Glass & Bilateral Patchy shadows	No	Yes
Comorbidities	COPD/Smoker	No	Yes
	Cancer	No	Yes
	Hypertension & Chronic heart disease	No	Yes
	Chronic renal disease	No	Yes
	Diabetes mellitus	No	Yes
Dyspnea	RR>30/minute	No	Yes
	O <sub>2</sub> saturation<90 %	No	Yes
<b>Total Score</b>			

Fig. 1. ABCD Scoring for triage of patients with COVID-19 + Patients.

or CT scan of thorax as a variable of evaluation. The radiologic features in patients with COVID-19 are bilateral pulmonary infiltrates and ground glass opacity. Also in current scores respiratory rate and oxygen saturation were included as an evaluation of pulmonary parameters. As blood markers leucocyte counts, lymphocyte counts, LDH, inflammatory marker CRP level, D-Dimer can be helpful blood markers. Comorbidities play major role in the outcomes of patients with COVID-19 and we had included these medical conditions in this scoring system. The current scoring tool is used the letters from alphabets making it as easy system to remember and utilized by medical professionals. Also it is an objective method which is helpful in decision making of treatment of patients. The use of traffic signal colors i.e. green, yellow and red; makes this score useful to useful for global understanding.

We compared the published scores for COVID-19 with the current scoring system (Table 1). In the published scores there was no variable on the role of chest radiograph and CT scan of chest. Also none of the scores that included dyspnoea (Respiratory rate and O<sub>2</sub> saturation) as it is important respiratory parameter in corona infection. CRP level is an important biochemical marker level in evaluation of COVID-19 infection and is helpful to assess the inflammatory process.

Our score is easily reproducible as we have utilized a simple alphabet to describe the important demographic, clinical and

Total Score=

Green	Yellow	Red
0-4	4-8	>8
Mild	Moderate	Severe
Observation: Symptomatic treatment in ward	Active treatment: Semi-critical care & Oxygen supplementation	Urgent treatment: Critical & Intensive care

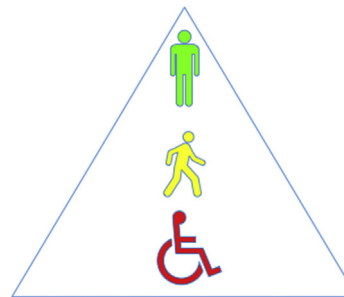


Fig. 2. ABCD scoring system and color coding triage system.

laboratory and radiological parameters which would help to predict severity in patients with COVID-19. We used a modern medical triage system to assign specific color codes to the patients and divide them according to the required treatment. Such triage is usually used in war and mass causality settings [9,10].

The advantages of this scoring system above all is that it is easy to memorize and would help the health care workers to prioritize the severe patients and early transfer to the intensive care. In a developing countries the medical resources including number of ICU beds and ventilators are limited, and in a global pandemic its appropriate utilization is the priority.

**5. Limitations of current study**

The limitation of our score lies in the absence of its validation. However, if validated, this may allow efficient utilization of medical resources.

**6. Conclusion**

This study is, to our knowledge, is the first scoring tool that has been prepared by Indian health care professional's and used alphabets A, B,C,D as variables for evaluation of admitted patients with COVID-19. This triage tool will be helpful in better management of patients with COVID-19. This score component includes clinical and radiopathological findings. A multi-centre study is required to validate all available scoring systems.

**Table 1**

Review of Literature of Scoring system predicting severity of infection with COVID-19 and comparison with current proposed score.

Sr. No.	Author Name	Name of the Score	Source of Score Online/Journal	Year	Country	Purpose of Scoring System	Key Features
1	Salunke et al. <sup>3</sup>	ABCD score	Diabetes & Metabolic Syndrome: Clinical Research & Reviews,	2020	India	# Score for patient and emergency department # Scoring performed prior to COVID-19 testing	A: Age B: Body temperature C: Cough C: Comorbidities D: Dyspnea
2	Shi et al. <sup>4</sup>	Host Risk Score	Critical Care	2020	China	Severity risk	Age Sex Hypertension
3	Duca et al. <sup>5</sup>	Brescia-COVID respiratory severity scale	EB Medicine	2020	Italy	Severity risk	Patient Wheezing Respiratory rate Pa O <sub>2</sub> Sp O <sub>2</sub> Chest Xray
4	Dong et al. <sup>6</sup>	CALL Score	Clin Infect Disease	2020	China	Progression Risk	Comorbidity Age Lymphocyte LDH
5	Lee Wallis et al. <sup>7</sup>	Covid-19 Severity Score	African journal of Emergency	2020	South Africa	Severity Risk	Comorbidities Mobility Assessment Temperature Pulse Respiratory rate Systolic BP
6	Hai Hu et al. <sup>8</sup>	MEWS REMS	Acad Emerg Med	2020	China	Mortality Predication	–
7	<b>Current Study</b>	<b>ABCD score</b>	<b>Current study</b>	<b>2020</b>	<b>India</b>	<b>Severity risk and triage for COVID-19 + Patients</b>	<b>A: Age B: Blood tests (Leucopenia, lymphocytopenia, CRP level, LDH level, D-Dimer) C: Comorbidities (COPD, Cancer, Hypertension, Chronic renal failure, Diabetes mellitus) C: Chest X-ray and CT scan (Ground glass and bilateral patchy shadows) D: Dyspnea (Respiratory rate &amp; O<sub>2</sub> saturation)</b>

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Nil.

**Declaration of competing interest**

Nil.

**References**

- [1] Nandy K, Salunke A, Pathak SK, Pandey A, Doctor C, Puj K, Sharma M, Jain A, Warikoo V. Coronavirus disease (COVID-19): a systematic review and meta-analysis to evaluate the impact of various comorbidities on serious events. *Diabetes Metab Syndr* 2020 Jul 2;14(5):1017–25.
- [2] Abhijeet Ashok Salunke, Nandy Kunal, Pathak Subodh Kumar, Shah Jaymin, Kamani Mayur, Kotakotta Vishwanth, et al. Impact of COVID -19 in cancer patients on severity of disease and fatal outcomes: a systematic review and meta-analysis. *Diabetes & Metabolic Syndrome: Clin Res Rev* 2020;14(Issue 5):1431–7.
- [3] Abhijeet Ashok Salunke, Pathak Subodh Kumar, Dhanwate Anant, Warikoo Vikas, Nandy Kunal, Mendhe Harshal, et al. A proposed ABCD scoring system for patient's self assessment and at emergency department with symptoms of COVID-19. *Diabetes & Metabolic Syndrome. Clin Res Rev* 2020;14(Issue 5):1495–501.
- [4] Shi Y, Yu X, Zhao H, Wang H, Zhao R, Sheng J. Host susceptibility to severe COVID-19 and establishment of a host risk score: findings of 487 cases outside Wuhan. *Crit Care* 2020;24(1):2–5.
- [5] Duca A, Piva S, Focà E, Latronico N, Rizzi M. Calculated decisions: brescia-COVID respiratory severity scale (BCRSS)/Algorithm [Internet] *Emerg Med Pract* 2020 Apr 16 [cited 2020 May 5];22(5 Suppl):CD1–2. Available from, <http://www.ncbi.nlm.nih.gov/pubmed/32297727>.
- [6] Ji D, Zhang D, Xu J, et al. Prediction for Progression Risk in Patients with COVID-19 Pneumonia: the CALL Score [published online ahead of print, 2020 Apr 9]. *Clin Infect Dis* 2020. <https://doi.org/10.1093/cid/ciaa414>.
- [7] Wallis LA. COVID-19 severity scoring tool for low resourced settings [internet]. *African journal of emergency medicine. African Federation for Emergency Medicine* 2020 [cited 2020 May 5]. Available from, <http://www.ncbi.nlm.nih.gov/pubmed/32292690>.
- [8] Hu H, Yao N, Qiu Y. Comparing rapid scoring systems in mortality prediction of critical ill patients with novel coronavirus disease [Internet] *Acad Emerg Med* 2020 Apr 20 [cited 2020 May 5]; Available from, <http://www.ncbi.nlm.nih.gov/pubmed/32311790>.
- [9] Bazayr J, Farrokhi M, Khankeh H. Triage systems in mass casualty incidents and disasters: a review study with a worldwide approach. *Open Access Maced J Med Sci* 2019 Feb 15;7(3):482–94.
- [10] Skandalakis PN, Lainas P, Zoras O, Skandalakis JE, Mirilas P. "To afford the wounded speedy assistance": dominique Jean Larrey and Napoleon. In: *World journal of surgery*; 2006. p. 1392–9.

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