Article published online: 2022-06-29

Evolution of a Parsimonious Prognostic Index in COVID-19

Armaanjeet Singh[1] Ramesh Chand Kashav[1] Rohan Magoon[1] Iti Shri[1] Jasvinder Kaur Kohli[1]

[1] Department of Cardiac Anaesthesia, Atal Bihari Vajpayee Institute of Medical Sciences (ABVIMS) and Dr. Ram Manohar Lohia Hospital, New Delhi, India

J Card Crit Care

Address for correspondence Ramesh Chand Kashav, MD, Department of Cardiac Anaesthesia, Atal Bihari Vajpayee Institute of Medical Sciences (ABVIMS) and Dr. Ram Manohar Lohia Hospital, Baba Kharak Singh Marg, New Delhi, 110001, India (e-mail: drkashav@yahoo.co.in).

In the December 2021 issue of the *Journal of Cardiac Critical Care*, we proposed a promising prognostic index, shock index (SI) for risk-stratifying the patients ailing from coronavirus disease 2019 (COVID-19).[1] While it is indeed gratifying to witness an increasing research interest in the subject,[2–5] the elucidation of nuances of the accruing literature would be of potential interest to the readers of the *Journal*.

Reiterating the basics of the classically described prognostic index, SI is computed as the ratio of heart rate (HR) to systolic blood pressure (SBP).[6] Alongside being conducive to the prediction of hemodynamic instability in patients with myocardial infarction and sepsis, the former has also been propounded as a prognostic marker for the in-hospital mortality prediction.[7] Notably, a normal SI (0.5–0.7) along with the absence of an elevated lactate level has been associated with a very low risk for severe sepsis at presentation.[8]

Talking specifically of SI-based prognostication in COVID-19, there have been four studies that analyzed the merit of SI among patients with COVID-19 over the past 2 years of the pandemic. The first study by Doğanay et al provided results in favor of the mortality predictive value of SI.[2] In a retrospective evaluation of 489 COVID-19 patients using CHAID (Chi-Square Automatic Interaction Detection Technique" is a statistical tool used for comparing relationship between variables) analysis, they highlighted SI as the factor with the highest predictive value within any given age group with a cutoff of 0.93. They also noted an increase in the association of SI and mortality with advanced age (mortality in patients with SI $>$ 0.93 and age $<$ 56 years old = 26.9%, 56–77 years = 80.5%, $>$ 77 years = 91.4%). These results were corroborated by Kurt et al in their efforts to investigate the mortality predictive potential of SI and modified SI (HR/mean arterial pressure).[3] Using the data of 464 patients evaluated retrospectively, they noted a higher predictive power of modified SI compared with SI (DeLong's test, AUC difference = –0.020, $p = 0.003$). Similarly, a research endeavor by Ak et al compared various threshold values of SI (0.7, 0.8, 0.9, and 1.0) in 364 COVID-19 cases to assess the predictive performance in terms of intensive care unit (ICU) admission and mortality rate.[4] A pre-hospital SI $>$ 0.9 was found to be predictive of a higher ICU admission and mortality rate. While these studies show a beneficial aspect of employing SI in risk stratification of COVID-19 patients, van Rensen et al could not elicit a similar result in their study. Their retrospective analysis of 411 patients revealed no discernible discriminative potential of SI for ICU admission and mortality in COVID-19 patients.[5]

Being a purely hemodynamic parameter, SI emerges as a useful metric for physiological status monitoring.[9] At the same time, the inclusion of other vital-system monitoring parameters in SI can buttress the subsequent prognostic potential. The former becomes all the more pertinent in the context of a multifaceted syndrome, as seen in severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Among the various modifications made to the classical SI, some appear to be more suitable than others in prognosticating poor outcomes in these cases. Inclusion of respiratory rate in respiratory adjusted shock index (RASI), age in age-adjusted shock index or Horowitz index (partial pressure of arterial oxygen/fractional inspired concentration of oxygen,

DOI https://doi.org/10.1055/s-0042-1750197.
ISSN 2457-0206.

Thieme Medical and Scientific Publishers Pvt. Ltd., A-12, 2nd Floor, Sector 2, Noida-201301 UP, India

or the PaO_2/FiO_2 ratio) in SIPF (shock index and hypoxemia) can improve the risk stratification and triage for early segregation of high-risk cases. However, the current literature does not comprehensively map the possible benefits of these indices.

While the SI appears to be a useful parameter in determining the need for hospitalization of patients presenting with COVID-19, its predictive potential for poor outcomes in these cases still remains to be ascertained. It will be enlightening to research in a larger setting to unearth the variables affecting prognosis in COVID-19. On a positive note, such parsimonious indices and the corresponding risk-stratification may continue to be prognostically fruitful within and well beyond the pandemic era.

Conflict of Interest
None declared.

References

1 Dey S, Magoon R, Kohli JK, Kashav RC, ItiShri I, Walian A. Shock index in COVID Era. J Card Crit Care 2021;05:268–272

2 Doğanay F, Elkonca F, Seyhan AU, Yılmaz E, Batırel A, Ak R. Shock index as a predictor of mortality among the Covid-19 patients. Am J Emerg Med 2021;40:106–109

3 Kurt E, Bahadirli S. The usefulness of shock index and modified shock index in predicting the outcome of COVID-19 patients. Disaster Med Public Health Prep 2021. Doi: 10.1017/dmp.2021.187

4 Ak R, Doğanay F. Comparison of four different threshold values of shock index in predicting mortality of COVID-19 patients. Disaster Med Public Health Prep 2021. Doi: 10.1017/dmp.2021.374

5 van Rensen IHT, Hensgens KRC, Lekx AW, et al. Early detection of hospitalized patients with COVID-19 at high risk of clinical deterioration: Utility of emergency department shock index. Am J Emerg Med 2021;49:76–79

6 Allgöwer M, Burri C. "Shock index" [article in German]. Dtsch Med Wochenschr 1967;92(43):1947–1950

7 Al Jalbout N, Balhara KS, Hamade B, Hsieh YH, Kelen GD, Bayram JD. Shock index as a predictor of hospital admission and inpatient mortality in a US national database of emergency departments. Emerg Med J 2019;36(05):293–297

8 Rady MY, Nightingale P, Little RA, Edwards JD. Shock index: a re-evaluation in acute circulatory failure. Resuscitation 1992;23 (03):227–234

9 Magoon R. Physiological status monitoring with shock indices: context and precision equally matter!. Am J Emerg Med 2021; 45:631

