HACOR score to predict failure of non-invasive ventilation in patients with acute hypoxemic respiratory failure: When simplicity is best

Sir,

There is indeed no doubt that non-invasive ventilation (NIV) is extremely useful in patients who present with acute hypoxemic respiratory failure (AHRF). The advantages of NIV are several like it can be managed in wards by nurses and respiratory therapists and does not require physicians, intensivists, or anaesthesiologists all the time. Although NIV reduces work of breathing and avoids intubation in many patients, the rate of failure of NIV is very high (25-49%).[1]

To predict and identify patients on NIV who could eventually fail NIV trial and require invasive ventilation, Duan *et al*.[2] described the heart rate, acidosis, consciousness, oxygenation, respiratory rate (HACOR) score. This scale takes into account heart rate (H), acidosis- based on pH (A), consciousness- based on Glasgow Coma Scale (C), oxygenation (O), and respiratory rate (R), all of which are easily available at the bedside for consideration. In a test cohort of 449 patients with AHRF, the authors found that the failure rate with NIV was 47.8 and 39.4% in the test and validation cohorts. The authors concluded that patients with a HACOR score of more than 5 had a very high risk of NIV failure and would require early intubation to reduce hospital mortality.

Later on, Duan *et al*.[3] recruited 500 chronic obstructive pulmonary disease (COPD) patients in a derivation cohort to validate the HACOR scale in these patients to predict NIV failure. The HACOR score was collected at 1–2 h of NIV initiation in order to predict NIV failure. On analysis, the authors concluded that HACOR scores demonstrated good predictive power for NIV failure in patients with COPD, and predicted early NIV failure (in less than 48 h). High-risk patients who were identified with NIV failure were intubated early which eventually led to decreased hospital mortality.

Guia *et al*.[4] conducted a prospective, multicentric study in 128 patients admitted with COVID19 pneumonia and presented with AHRF and were initiated on continuous positive airway pressure (CPAP). HACOR score was calculated 1 hour after initiation of CPAP which was compared to the PaO_2/FiO_2 (P/F) ratio. A total of 35 patients (27.3%) failed CPAP and were intubated. The accuracy of the HACOR score for predicting CPAP failure on analysis of the data was found to be 82.03% when compared to PaO_2/FiO_2 which was 81.25%. The authors concluded that although the HACOR score could identify patients who would eventually fail CPAP, still the P/F ratio was a better predictor of failure.

In another study by Ding *et al*.,[5] the authors included 148 non-COPD patients with AHRF (sleep apnea-hypopnea syndrome-52, chronic thoracic

sequelae-34, bronchiectasis- 31, chest wall deformity-14, obesity-hypoventilation syndrome-5, and miscellaneous-12). On analysis, the authors found that for 24 h from the time of NIV initiation, patients with a high HACOR score eventually failed the NIV trial. A total of 19 patients (13%) underwent tracheal intubation owing to NIV failure. The authors concluded that the HACOR score has high sensitivity and specificity (at 1-2 h, the score of 5 with a sensitivity of 90% and a specificity of 85%, after 12 h-4 with a sensitivity of 82% and a specificity of 91%, after 24 h- 2 with a sensitivity of 100% and a specificity of 76%) for predicting NIV failure among non-COPD patients for acute-on-chronic respiratory failure with respiratory acidosis.

Later on, Magdy *et al*.[6] assessed the validity of HACOR score in AHRF patients who were initiated on high-flow nasal cannula (HFNC). Of the total 150 patients enrolled in this study, 100 (66.7%) had a successful treatment while 50 (33.3%) failed HFNC therapy. They found out that the patients with HFNC failure had a higher HACOR score at initiation and thereafter at 1, 12, 24, and 48 h, and required invasive ventilation. They concluded that a HACOR score of less than 6 after 1 h with HFNC correlated with less than 85% risk of failure.

HACOR scale appears to be a useful scoring system to predict failure of NIV and HFNC trials in patients with AHRF. Well-designed, adequately powered studies are necessary to establish its efficiency to identify the failure of non-invasive modalities in patients with AHRF.

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Conflicts of interest
There are no conflicts of interest.

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