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Letter to Editor



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Use of integrated pulmonary index (IPI) in clinical practice

Serdar Özdemir✉

Ümraniye Research and Training Hospital, Istanbul, Turkey

Dear Editor,

In critical care practice, evaluating the respiratory status of patients is crucial, especially given the complexity and severity of conditions that necessitate close respiratory monitoring. Respiratory pathologies, such as acute respiratory failure, chronic obstructive pulmonary disease, pulmonary embolism, pneumonia, and other conditions requiring mechanical ventilation, demand precise and comprehensive evaluation to ensure effective management[1-3]. Mechanical ventilation is the process of providing external respiratory support with a ventilator device in patients who do not have spontaneous respiration. It is not the first-choice treatment method because it is an invasive procedure with a high complication rate compared to other treatment options. However, if noninvasive mechanical ventilation is unsuccessful or contraindicated, and adequate oxygen supplementation cannot be provided despite $\text{FiO}_2 > 0.5$, invasive mechanical ventilation should be used[4].

Traditionally, the evaluation of respiratory function has relied on monitoring respiratory rate and SpO_2 . However, these parameters alone are not sufficient to provide a comprehensive assessment of respiratory function. The addition of end-tidal CO_2 (etCO_2), measured by capnograph, is critical in respiratory assessment as it provides valuable information on the patient's ventilatory status. To achieve a more holistic evaluation of respiratory function, parameters such as arterial SpO_2 , etCO_2 , respiratory rate, and heart rate are integrated. This integration can present as a single value for easy evaluation of ventilation and oxygenation, known as the integrated pulmonary index (IPI)[5].

The IPI combines these parameters into a mathematical model to generate a single index value. This value simplifies the interpretation of respiratory status by healthcare professionals. The IPI can be viewed through a monitor as either a waveform or a numerical value. Literature on the IPI indicates its use in various clinical settings, including procedures performed under sedation, intensive care units for evaluating ventilator/patient compliance, monitoring the weaning process, and postoperative follow-up of patients who have undergone coronary artery bypass surgery[6].

The IPI has garnered attention due to its ability to provide non-

invasive, dynamic, and simultaneous measurements. It displays respiratory status with high sensitivity and specificity, allowing for early detection of respiratory problems and timely intervention. A special mathematical model, the Fuzzy Logic Mathematical Model, is used in the algorithm to obtain IPI values. This model is an artificial intelligence system that evaluates variables based on known probabilities to reach a result. The IPI value is evaluated on a scale from 1 (respiratory failure) to 10 (normal breathing). The IPI categorizes the patient's condition as follows: 8-9 is close to normal, 7 is close to normal but should be monitored carefully, 5-6 requires attention, 3-4 necessitates intervention, and 1-2 requires urgent intervention[7].

The IPI offers numerous advantages in clinical practice. Its non-invasive nature and lack of additional costs make it an attractive option for respiratory monitoring in intubated patients. It facilitates the follow-up of physicians by providing a single, integrated score that encompasses multiple respiratory parameters. This integrated approach not only offers insights into the patient's respiratory status but also aids in predicting mortality and determining the appropriate timing for weaning the patient off mechanical ventilation.

By integrating multiple respiratory parameters into a single index, the IPI simplifies the interpretation of respiratory status and enhances clinical decision-making[8,9]. Its applications in various clinical settings underscore its importance in improving patient outcomes

✉To whom correspondence may be addressed. E-mail: dr.serdar55@hotmail.com

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and ensuring respiratory safety. As the use of the IPI becomes more widespread and further studies are conducted, it is anticipated that its role in respiratory monitoring will continue to grow, guiding healthcare professionals in providing better care for their patients.

Conflict of interest statement

The authors report no conflict of interest.

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