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COMMENTARY

Breathing is good

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Alveolar ventilation is vital to maintain cellular function. Ventilation provides oxygen to the mitochondria and removes carbon dioxide from the cell, maintaining the internal milieu. Respiratory rate and tidal volume are the key components of ventilation and these are controlled by central and peripheral chemoreceptors that respond to the partial pressures of oxygen, carbon dioxide and acid–base (pH) status. The central control is the respiratory center that is located on the ventral surface of the medulla. The body maintains a normal environment by increasing respiratory rate in response to hypoxia, hypercarbia and acidosis. Early sepsis may be detected by closely monitoring for an increase in respiratory rate. Alveolar ventilation, especially respiratory rate, may be reduced by sedative and opioid medications. Therefore technology that noninvasively, continually and accurately monitors ventilation in the unintubated patient is needed.

Respiratory rate is an important vital sign that is frequently neglected yet it is an early warning sign of a potentially critical situation [1–4]. Voscopoulos et al. [5] in this issue of JCMC describe a new technology for accurately monitoring ventilation in the extubated patient. This technology is an advance on the commonly used thoracic impedance plethysmography. The chest wall expands with each inspiration, causing variations in the air volume in the lungs and altering the thoracic impedance. This change in impedance has been used as a continuous monitor of respiratory rate usually using the EKG pads as the sensors [6]. However, this technology historically has had limited deployment because of a significant error rate in detecting obstructed breathing, particularly in patients with obstructive sleep apnea. The continued chest wall movement has presented a signal that is recorded as respiratory rate despite the obstructed glottis and minimal air movement [7]. The non-invasive Respiratory Volume Monitor appears to have addressed this drawback and provides continuous, real time, quantitative measurements of minute ventilation, tidal volume and respiratory rate. The data published so far shows an error rate of <10 % [8].

The gold standard for detecting respiratory depression is capnography. This however has some limitations in that some patients, particularly children, frequently dislodge the nasal cannula. A recent publication has just demonstrated the lack of efficacy for capnography in preventing hypoxemia during propofol sedation [9].

Finally investigators and scientists are developing robust technologies to continually monitor patients breathing spontaneously during sedation, and to detect postoperative opioid induced respiratory depression and as an important monitor in the very critically ill [10, 11]. This Respiratory Volume Monitor appears to be a strong addition to our armamentarium and will fit the requirements of both the Joint Commission and Centers for Medicare and Medicaid Services, that patients receiving intravenous opioids while on bed-rest should be continually monitored for adequate ventilation [12, 13].

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