



## Indirect calorimetry still the best REE assessment tool for ventilated patients



Indirect calorimetry (IC) measurement is considered the gold standard for the assessment of resting energy expenditure (REE). It is based on the measurement of oxygen and carbon dioxide consumption ( $VO_2$  and  $VCO_2$ , respectively). Where IC is not possible, REE derived from  $VCO_2$  obtained from the ventilator may be the best alternative. However, new research shows the level of agreement of REE obtained from  $VCO_2$  readings with REE obtained from IC was generally low. Thus, for defining the appropriate calorie target in critically ill patients, IC remains the best tool, according to the research published in the journal *Critical Care*.

IC use is limited by cost and technical issues, hence the use of  $VCO_2$  alone has recently been suggested as an alternative method to calculate REE in mechanically ventilated patients. This method is based on the Weir equation, where  $VO_2$  is not measured but is derived as being equal to  $VCO_2/RQ$ , where RQ is the respiratory quotient which in turn is derived from  $VCO_2/VO_2$ . This is defined as the REE- $VCO_2$ . However, the level of accuracy of REE- $VCO_2$  is uncertain. The RQ value may vary according to substrate utilisation and therefore the REE calculation may differ accordingly.

The present study was conducted to compare the REE- $VCO_2$  with the REE derived from IC. This was a retrospective study conducted at the general intensive care unit of a single university-affiliated tertiary medical centre. Patients included were invasively ventilated and their REE was measured by using IC. The RQs were set at 0.8, 0.85, and 0.89. Data were collected from computerised patient files. REE obtained from the ventilator by using  $VCO_2$  (REE- $VCO_2$ ) alone was compared with REE obtained from IC (REE-IC).

For this study, measurements were obtained for 80 patients, and 497 REE-IC measurements were compared with REE- $VCO_2$  obtained at the same time. The mean REE-IC was  $2,059.5 \pm 491.7$  kcal/d. The mean REE-RQs corresponding to RQs of 0.80, 0.85, and 0.89 were  $1936.8 \pm 680.0$ ,  $2017.8 \pm 708.8$ , and  $2,122.1 \pm 745.4$  kcal/d, respectively. REE- $VCO_2$  derived from an RQ of 0.85 had the lowest mean difference from REE-IC. Whereas accuracy was higher using an RQ of 0.85, agreement (between 85% and 115%) was highest using an RQ of 0.89.

In this study, "we demonstrated the ability of  $VCO_2$  to predict REE based on measurements by the calorimeter and specific regression with very high accuracy (agreement). This represents the 'ceiling' of possibility of using  $VCO_2$ , but it remains unclear whether this applies to  $VCO_2$  measurements made by the ventilator," the authors note.

According to the authors, using  $VCO_2$  to estimate energy expenditure is challenged by a medical hazard: the quite unpredicted error as compared with the gold standard. If mean (median) values presented may perhaps be

acceptable, the larger scatter is not, the authors point out.

The study has several limitations, including its retrospective design such that the study did not take into account sedation, ventilator types, and settings but used a VCO<sub>2</sub> measurement over the 6 hours preceding the assessment. Also, the RQ examined used predefined common values and was not obtained according to nutritional intake. Although the sample size was comparable to that of other studies, it was small and single-centred.

Source: [Critical Care](#)

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