

Keyword: Limitations of Indirect Calorimetry include:

1. Accurate assessment of REE and RQ may not be possible because of patient condition or certain bedside procedures or activities.
2. Inaccurate measurement of REE and RQ may be caused by leaks of gas from the patient/ ventilator system preventing collection of expired gases including: Leaks in the ventilator circuit, leaks around tracheal tube cuff or uncuffed tubes, leaks through chest tubes or bronchopleural fistula
3. Inaccurate measurement of REE and RQ occurs during peritoneal and hemodialysis due to removal across the membrane of CO<sub>2</sub> that is not measured by the indirect calorimeter
4. Inaccurate measurement of REE and RQ during open circuit measurement may be caused by: Instability of delivered oxygen concentration (FIO<sub>2</sub>) within a breath or breath to breath due to changes in source gas pressure and ventilator blender/mixing characteristics, **FIO<sub>2</sub> > 0.60**, Inability to separate inspired and expired gases due to bias flow from flow triggering systems, IMV systems, or specific ventilator characteristics, The presence of anesthetic gases or gases other than O<sub>2</sub>, CO<sub>2</sub>, and nitrogen in the ventilation system, The presence of water vapor resulting in sensor malfunction, Inappropriate calibration, Connection of the indirect calorimeter to certain ventilators, with adverse effect on triggering mechanism, increased expiratory resistance, pressure measurement, or maintenance of the ventilator, Total circuit flow exceeding internal gas flow of indirect calorimeter that incorporates the dilutional principle, Internal leaks within the calorimeter, Inadequate length of measurement

REF:

1. Weissman C. Measuring oxygen uptake in the clinical setting. In: Bryan-Brown CW, Ayres SM, editors. Oxygen transport and utilization. Fullerton CA: Society of Critical Care Medicine; 1987:25-64.
2. Kemper MA. Indirect calorimetry equipment and practical considerations of measurement. In: Weissman C, editor. Problems in respiratory care: nutrition and respiratory disease. Philadelphia: JB Lippincott: 1989;2:479- 490.
3. Branson RD. The measurement of energy expenditure: instrumentation, practical considerations, and clinical application. Respir Care 1990;35(7):640-656; discussion 656-659.
4. Browning JA, Linberg SE, Turney SZ, Chodoff P. The effects of a fluctuating FIO<sub>2</sub> on metabolic measurements in mechanically ventilated patients. Crit Care Med 1982;10(2):82-85.
5. Ultman JS, Bursztein S. Analysis of error in the determination of respiratory gas exchange at varying FIO<sub>2</sub>. J Appl Physiol 1981;50(1):210-216.
6. AARC Clinical Practice Guideline Metabolic measurements using indirect calorimetry During Mechanical Ventilation—2004 Revision & Update

The accuracy of an indirect calorimeter is better in the following situation:

- a. Patient with chest tubes
- b. Patient on hemodialysis
- c. FiO<sub>2</sub> of 45%
- d. Patient with bronchopleural fistula
- e. The presence of anesthetic agent in the circuit

Answer: D. See keyword