Indirect calorimetry via the metabolic cart.

- Measures energy expenditure.
- It is called “indirect” because the caloric burn rate is calculated from a measurement of oxygen uptake.
- Determines energy expenditure by measuring gas exchange.
- Measurement of O2 uptake & CO2 production reflects the rate of cellular metabolism- food sources (Carbohydrate; Fat; Protein) are metabolized to produce energy.
- The oxygen consumed and the carbon dioxide produced are measured to provide an indirect assessment of energy expenditure.
- Determines REE and RQ (Respiratory Quotient):
  - RQ is determined when the patient reaches a steady state condition (equilibrium)
    - RQ reflects the food source that is being metabolized by the cells for energy.
    - RQ = VCO2/ VO2
    - An RQ > 1 represents overfeeding or pure CHO metabolism
    - An RQ < 0.7 represents starvation
    - Normal RQ = 0.85
- In order to achieve an accurate Met Cart test the patient should be fasting so that the RQ will be able to best assess the nutritional status.
The Technology Used:

- VMAX 29 Encore Model
- Software at MGH: Cardiosoft 6.51 version software, VMAX Encore software
- Software at CNY: Cardiosoft 4.2 version software, VMAX 21-1

Sample report from VMAX for estimating REE and RQ
• Most participants will be asked to fast prior to this test; depending on the study they may require different lengths of time.

• Participants will be asked to lie down in a bed and get comfortable.

• The test measures resting energy expenditure so they will be asked to remain as still as possible, and avoid talking or moving, and requested to not fall asleep. If they do need to move slightly, that is ok.

• A transparent plastic dome or bubble will be placed over the participant’s head, and they will be asked to breathe normally for 15-20 minutes. Room air will be flowing into the dome.

• Throughout the test the subject will be left alone in order to relax. Periodically throughout the test a dietitian or technician will be monitoring them and adjusting computer as needed.

• The most common complaint from participants is that it gets warm under the bubble during the test.

• Depending on the study, the results of the analysis may or may not be given to the participants. Participants should talk to their study coordinator for specifics about the study they are in.