SINPE
Società Italiana di Nutrizione Artificiale e Metabolismo

FICK PRINCIPLE: AN OLD NEW WAY ALTERNATIVE TO INDIRECT CALORIMETRY?

Giuseppe Umana

II Servizio Anestesia e Rianimazione, AOU Policlinico San Marco, CATANIA

Energy Expenditure (EE), can be estimated (Harris Benedict formula and similaries) or measured. There are two ways to measure EE: Indirect Calorimetry (IC) and Fick Principle. Both methods based on O2 Consumption and CO2 production. IC is targeted as Gold Standard to measure EE, but it isn't a really common practice in ICU. The expensive device, the weak familiarity and intrinsic limits, make the technique more proclaimed than really adopted. In COVID experience, we resumed the old Fick Principle: If we know 3 variables (Arterial O2 Content – Central Venous O2 Content – Cardiac Output) we can easily calculate Oxygen Delivery and Consumption (DO2, VO2). In ICU, in a large amount of patients is placed an arterial and a CVC cannula. And often we can measure Cardiac Output by invasive techniques or by Ecocardiography.
We realized a friendly user DataSheet to measure EE on input Blood Gas Analysis (BGA) data and Cardiac Output. We named it CIRO: Cardiac Index Related to Oxygen
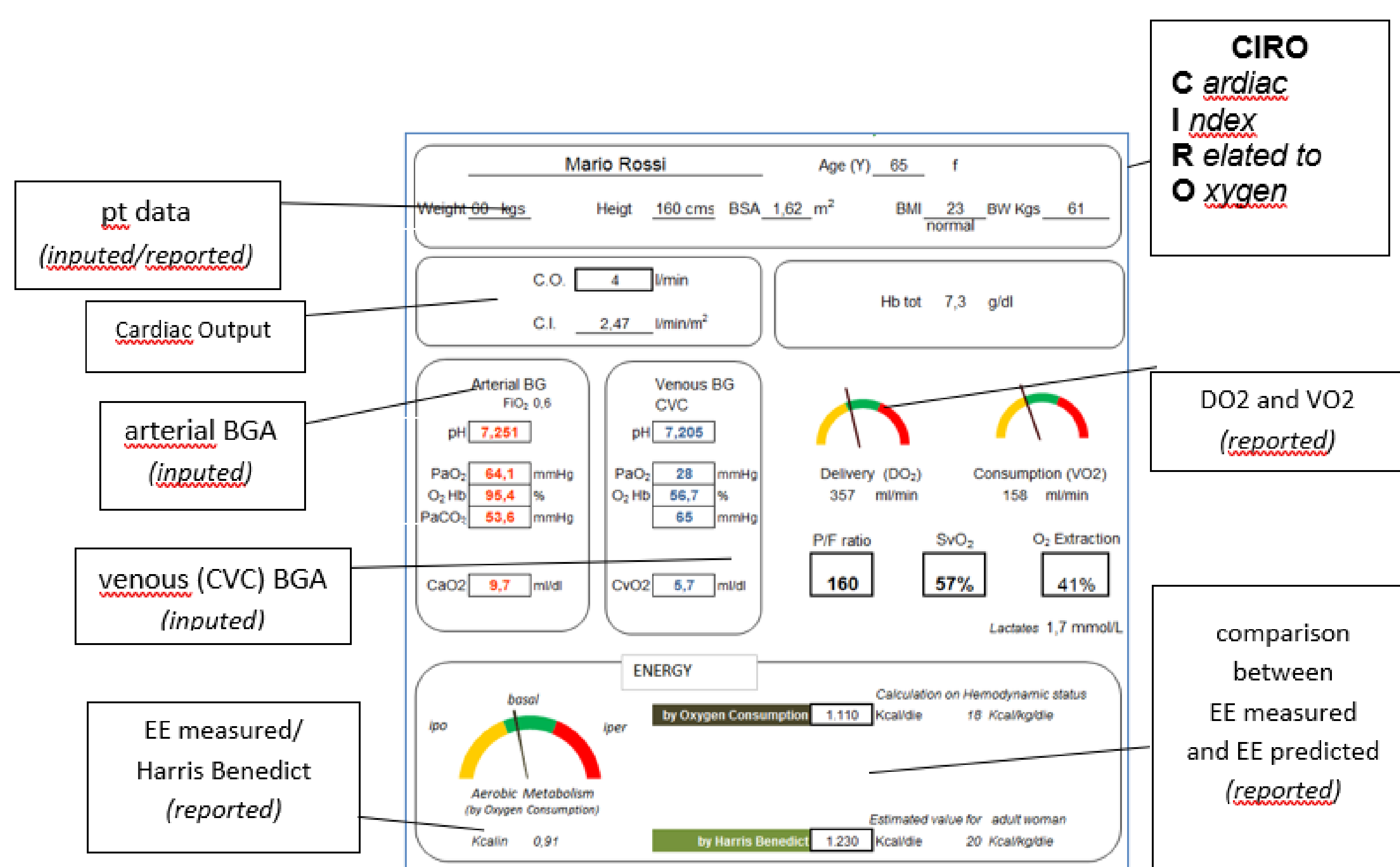
We made this calculation public domain on free access website www.ciroeilgiocodelletrepalle.it
This datasheet shows the close relationship between hemodynamics, BGA and Energy. Where the Energy Expenditure rises from "Cinderella" to "absolute Queen of metabolism". Haemodinamics and Gas Exchanges are ancillary to EE.
This DataSheet can be used as "Metabolic Simulator" capable to predict Respiratory Failure or Cardiac Failure according to inputed data and automatic reports.
We have created nothing new. We have just looked the old knowledges with different eyes.
This method has some limits: The EE value is only from VO2, it doesn't consider Anaerobic Metabolism. We assume that BGA Values from CVC is rather the same in Pulmunary Artery. It doesn't work in case of altered perfusion in upper body (i.e. Cerebral Death).
No commercial support involved in this paper. No advertise in website