

### Accurate measurement of oxygen consumption in ventilated patients undergoing cardiac catheterization and after cardiac surgery

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$\dot{V}O_2$  is an important part of hemodynamic and oxygen transport assessments in patients during cardiac catheterization and in the intensive care unit (ICU). Accurate measurement of  $\dot{V}O_2$  is vital, since any error in the measurement of  $\dot{V}O_2$  will translate directly into an equivalent percentage under- or over-estimation of blood flows and vascular resistances. In ICU patients during the early postoperative period after cardiac surgery, the estimation of  $\dot{V}O_2$  is even more exposed to inaccuracies because of the significant metabolic and hormonal changes imposed by cardiopulmonary bypass.  $\dot{V}O_2$  is increased and highly variable both within patients and between patients. Estimated  $\dot{V}O_2$  gives us a single value for a given patient, making no provision for the dynamic patient milieu. It is still common practice to estimate  $\dot{V}O_2$  values from published predictive equations. However, considerable errors introduced by using the predictive equations have been reported, including the most commonly used Lafarge equation, particularly in children younger than 3 years of age. Such estimations are now unacceptable for both clinical decision-making and research. Respiratory mass spectrometry remains the 'state-of-the-art' method, allowing highly sensitive, rapid and simultaneous measurement of multiple gas fractions. The AMIS 2000 quadrupole respiratory mass spectrometer system has been adapted to measure  $\dot{V}O_2$  in patients under mechanical ventilation with during cardiac catheterization and in the ICU. It is a unique and powerful tool for bedside continuous measurement of  $\dot{V}O_2$  in cardiac catheterization and ICU for both clinical and research purposes. Other indirect calorimeters will be also reviewed. This technique has allowed us to obtain, for the first time, actual and precise assessments of each element of systemic hemodynamics and oxygen transport in neonates after the Norwood procedure, and thus has improved our understanding of the complex Norwood physiology and postoperative management in the very challenging group of patients.

### Biography

Jia Li, MD PhD obtained her PhD on  $O_2$  transport in children after CPB in 2002. She has developed a world-wide reputation for the use of respiratory mass spectrometry as an experimental and clinical research tool, and this technique continues to provide the gold standard of data in the field. She has had 60 publications with focus on systemic and regional  $O_2$  transport in patients undergoing cardiac catheterization and after cardiac surgery.