



Study Investigates the Utility of Continuous Noninvasive Hemoglobin Measurement With Masimo SpHb®



Masimo has announced the findings of an abstract presented at [Euroanaesthesia 2018](#) in which researchers compared Masimo noninvasive and continuous hemoglobin (SpHb®) to intermittent and invasive lab hemoglobin (LabHb) in reflecting iatrogenic hemodilution during incremental fluid administration of patients undergoing major surgery.¹

In the study, Dr. Azriel Perel, Dr. Serban Bubenek, and colleagues at the Emergency Institute for Cardiovascular Diseases in Bucharest examined the effects of incremental fluid loading on oxygen delivery and on LabHb and SpHb as markers of possible iatrogenic hemodilution, which can necessitate blood transfusions that might otherwise be avoided. 40 adult patients undergoing major gastrointestinal or vascular surgery were enrolled. Oxygen saturation (SpO₂) and SpHb were continuously measured using a Masimo Radical-7® Pulse CO-Oximometer®. LabHb and partial pressure of oxygen (PaO₂) were intermittently, invasively measured using an ABL800 Radiometer. Cardiac output (CO) and stroke volume (SV) were continuously, invasively measured using an Edwards Vigileo monitor. Oxygen delivery (DO₂) was calculated as: $CO * ((Hb * 1.38 * SpO_2) + PaO_2 * 0.0031)$. Parameter values were recorded after induction of anesthesia (T0), and 5 minutes after successive 250 ml colloid fluid challenges (FC) (T1, T2, and T3). Patients were given the second and third fluid challenges if at each stage SV increased by at least 10%.

All 40 patients received the first FC, 33 received the second, and 22 received the third. The researchers found that there was “a statistically significant decrease in mean SpHb and LabHb after each FC.” For patients who received all 3 FCs, they noted that “SpHb and LabHb decreased significantly and similarly after each FC.” After infusion of the full 750 ml, SpHb and LabHb decreased by 1.66+/-0.67 g/dL and 1.7+/-0.7 g/dL, respectively, a decrease in Hb values which “explains the observed decrease in the DO₂.”

The researchers concluded, “Fluid loading as part of goal-directed therapy may cause a paradoxical decrease in DO₂ due to the development of iatrogenic hemodilution. The development of iatrogenic hemodilution is reflected

by a real-time decrease in the SpHb trend, which is similar to the intermittent LabHb trend.”

Dr. Azriel Perel commented, “In many studies on perioperative and septic patients, the patients who received more fluids seem to have received significantly more blood transfusions. The most probable reason for that is the development of acute dilutional anemia causing the hemoglobin value to decrease below the ‘transfusion threshold.’ This study clearly shows that fluid administration, given as part of the conventional perioperative goal-directed strategy aimed at maximizing the cardiac output, does indeed cause a significant acute decrease of the hemoglobin concentration, leading to a paradoxical decrease in oxygen delivery. This iatrogenic decrease in hemoglobin concentration may cause physicians to administer otherwise avoidable RBC transfusions. Our study also demonstrates that continuous monitoring of hemoglobin (SpHb) through Masimo Pulse CO-Oximetry sensors may detect the development of such iatrogenic hemodilution in real time.”

SpHb is not intended to replace laboratory blood testing. Clinical decisions regarding red blood cell transfusions should be based on the clinician’s judgment considering among other factors: patient condition, continuous SpHb monitoring, and laboratory diagnostic tests using blood samples.

Reference

1. Bubenek S, Valeanu L, Popescu M, Cacoveanu M, Tomescu D, and Perel A. Optimization of cardiac output by incremental fluid administration is associated with iatrogenic hemodilution and a paradoxical decrease in oxygen delivery. Proceedings from Euroanaesthesia 2018, Copenhagen, Denmark.

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