Continuous hemoglobin and plethysmography variability index monitoring can modify blood transfusion practice and is associated with lower mortality

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To determine the effect of implementing an algorithm of fluid and blood administration based on continuous monitoring of hemoglobin (SpHb) and PVI (plethysmography variability index) on mortality and transfusion on a whole hospital scale. This single-center quality program compared transfusion at 48 h and mortality at 30 days and 90 days after surgery between two 11-month periods in 2013 and 2014 during which all the operating and recovery rooms and intensive care units were equipped with SpHb/PVI monitors. The entire team was trained to use monitors and the algorithm. Team members were free to decide whether or not to use devices. Each device was connected to an electronic wireless acquired database to anonymously acquire parameters on-line and identify patients who received the monitoring. All data were available from electronic files. Patients were divided in three groups; 2013 (G1, n = 9285), 2014 without (G2, n = 5856) and with (G3, n = 3575) goal-directed therapy. The influence of age, ASA class, severity and urgency of surgery and use of algorithm on mortality and blood use were analyzed with cox-proportional hazard models. Because in 2015, SpHb/PVI monitors were no longer available, we assessed post-study mortality observed in 2015 to measure the impact of team training to adjust vascular filling on a patient to patient basis. During non-cardiac surgery, blood was more often transfused during surgery in G3 patients as compared to G2 (66.6% vs. 50.7%, $p < 0.001$) but with fewer blood units per patient. After adjustment, survival analysis showed a lower risk of transfusion at 48 h in G3 [OR 0.79 (0.68–0.93), $p = 0.004$] but not in G2 [OR 0.90 (0.78–1.04) $p = 0.17$] as compared to G1. When adjusting to the severity of surgery as covariable, there was 0.5 and 0.7% differences of mortality at day 30 and 90 whether patients had goal directed therapy (GDT). After high risk surgery, the mortality at day 30 is reduced by 4% when using GDT, and 1% after intermediate risk surgery. There was no difference for low risk surgery. G3 Patients had a lower risk of death at 30 days post-surgery [OR 0.67

(0.49–0.92) p = 0.01] but not G2 patients [OR 1.01, (0.78–1.29), p = 0.96]. In 2015, mortality at 30 days and 90 days increased again to similar levels as those of 2013, respectively 2.18 and 3.09%. Monitoring SpHb and PVI integrated in a vascular filling algorithm is associated with earlier transfusion and reduced 30 and 90-day mortality on a whole hospital scale.