Although blood pressure is a fundamental monitor during anesthesia and for critically ill patients, there is no universal definition of hypotension. A systematic review investigating perioperative hypotension, in fact, identified 130 papers that used 140 different definitions of hypotension. Our group has investigated methods to continuously monitor cerebral blood flow (CBF) autoregulation during cardiac surgery using time-domain methods whereby slow-waves in transcranial Doppler (TCD) measured CBF velocity are correlated with similar frequency changes in blood pressure. The hypothesis of our approach is that targeting blood pressure above the lower limit of CBF autoregulation provides an individual basis for blood pressure targets in anesthetized patients whom cannot convey symptoms of low blood pressure such as lightheadedness, nausea, or syncope. Similar methods in patients with traumatic brain injury suggest that optimizing cerebral perfusion pressure within the autoregulatory range is associated with improved patient outcomes. Near infrared spectroscopy (NIRS) is increasingly used in patients undergoing cardiac surgery to monitor cerebral oxygen supply vs demand balance. Since variables determining oxygen demand are relatively stable over short periods of time, we have shown that cerebral oximetry can be used as a surrogate for CBF for clinical, real-time autoregulation monitoring. We have found good correlation and agreement between autoregulation indices obtained with Doppler and cerebral oximetry. Since NIRS is non-invasive, requires little operator interventions, and is not associated with many of the limitations of TCD monitoring, these methods could be used in any center performing cardiac surgery. Ongoing studies are evaluating whether maintaining blood pressure above the lower limit of autoregulation during cardiopulmonary bypass is associated with improved neurological or renal outcomes.

References: