

Synopsis

The theoretical basis for better outcomes with the routine use of PA catheterization in NCS is derived from an improved understanding of perioperative hemodynamics by clinicians.⁴ However, there are no large RCTs proving its use improves patient outcomes,^{3,4} and pulmonary catheter placement is an invasive and costly procedure. Some have argued that the PA catheter is a monitoring device and, thus, patient outcomes should be based on the appropriate interpretation of the data provided as well as the therapeutic protocols implemented.⁵ Despite a decline in its use over the past years, PA catheterization remains the preferred method for monitoring hemodynamically unstable patients. In severely injured trauma patients with severe shock, advanced age, or acute HF, PA catheterization was associated with a survival benefit.^{1,2}

Recommendation-Specific Supportive Text

1. A retrospective data analysis of 53,312 patients admitted to intensive care units found that severely injured patients in shock, with advanced age, or with acute HF benefited from PA-guided management.¹ Another prospective, observational multicenter cohort

study reported that appropriate use of PA catheters decreased mortality in patients in acute HF, especially in hypotensive patients or those receiving inotropes.¹

2. Clinical trial data regarding the benefit of routine use of PA catheterization in NCS are sparse. One trial randomly allocated patients at high surgical risk, defined by an ASA risk score of III or IV, to medical management with or without the use of PA catheters.⁶ There were no differences found in mortality or morbidity, except for an increase in pulmonary embolism noted in the pulmonary artery catheter arm.⁶ In 2013, a systematic review and meta-analysis of 5 studies (n=2395) concluded the preoperative optimization and hemodynamic management guided by a PA catheter did not alter patient perioperative outcomes when compared with central venous pressure catheterization.³ The types of surgeries included vascular,^{7,8} abdominal, thoracic, orthopedic,⁶ abdominal reconstructive surgeries,⁹ as well as high-risk surgical patients.¹⁰ Similar results were reported in an additional study involving patients undergoing aortic reconstruction surgery.¹¹

8.4. Perioperative Anemia Management

Recommendations for Perioperative Anemia Management
Referenced studies that support the recommendations are summarized in the [Online Data Supplement](#).

COR	LOE	RECOMMENDATIONS
2a	A	1. In patients having NCS with expected blood loss, tranexamic acid is reasonable to reduce intraoperative blood loss, reduce transfusions, and avoid anemia. ¹⁻³
2a	B-R	2. In patients with iron deficiency anemia having elective NCS, iron therapy (either oral or intravenous) administered preoperatively is reasonable to reduce blood transfusions and to increase hemoglobin. ⁴⁻¹⁸

Synopsis

Even mild preoperative anemia is an independent risk factor for postoperative morbidity and mortality, including respiratory, urinary, wound, septic, and thromboembolic complications.^{10,19-22} Patients with CKD, diabetes, CVD, and HF have a high prevalence of anemia.²³⁻²⁶ Limited tissue oxygen delivery is a common mechanism of adverse outcomes in patients with anemia.²⁷ Anemia may contribute to myocardial ischemia, particularly in patients with CAD.²⁰ Postoperative hemoglobin is associated with myocardial injury, type 2 MI, and mortality.^{20,28} The World Health Organization defines anemia as a hemoglobin concentration <13 g/dL in men and <12 g/dL in women. Up to 64% of surgical

patients have anemia,^{19,29} more than half of which is moderate to severe.³⁰ Iron deficiency is responsible in 40% to 50% of cases.^{15,29-31} A ferritin concentration <100 ng/mL, transferrin saturation <20%, and/or microcytic hypochromic red cells (mean corpuscular volume <80 fL, mean corpuscular hemoglobin concentration <27 g/dL) are indicative of iron deficiency. A screening system in which anemia automatically triggers evaluation for iron deficiency using previously collected blood identifies iron-deficiency anemia far better than clinicians using normal procedures.³¹ Most anemias are correctable within 2 to 4 weeks. Anemia management programs decrease the rate of transfusions, complications, and mortality.⁹