

## What (if any) Special Factors Should Come into Preoperative Assessment of Patients for Bloodless Surgery?

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Patients who cannot be transfused for medical or religious reasons present unique management challenges in the setting of high anticipated intraoperative blood loss. "Bloodless surgery" is a relatively new discipline within perioperative care with the intent of safely avoiding transfusion while maintaining acceptable patient outcomes. The field of bloodless surgery emerged in the 1960s, when cardiac surgeons in Texas developed a 'bloodless prime' for cardiopulmonary bypass machines, enabling major cardiac surgery in patients excluded from such surgeries for reasons related to transfusion [1]. Although initially marginalized, the practice took increasing root with the safe blood scares of the 1980s and with subsequent discoveries of long term sequelae of blood storage in the 1990s and 2000s. The term "bloodless surgery" now describes a multimodal approach involving surgeons, anesthesiologists, hematologists, cardiologists, and numerous other practitioners. Traditionally, the term dictates a long-term approach deeply rooted in preoperative management to nontransfusable patients facing major surgery, although new attention is also being paid to emergency options or patients refusing transfusion [2].

As for most patients facing major surgery, preoperative considerations for bloodless surgery are directed towards assessing and optimizing preoperative functionality. The heart and lungs feature prominently among organ systems on the preoperative history and physical; any existing cardiopulmonary and metabolic derangements should be optimized preoperatively with initiation/ continuation of beta blockers in cardiac patients, achievement of glucose control in diabetic patients, treatment of active infections and bronchodilators in patients with COPD [3]. It is also crucial to identify risk factors for surgical bleeding, including platelet dysfunction, kidney and liver disease, and to examine fully home medications and herbal supplements for agents potentially increasing bleeding risk including obvious choices such as aspirin, anticoagulants and NSAIDs but also beta-lactams, some psychotropic drugs and many common herbal supplements, including ginkgo, garlic and ginseng. Any history of bleeding disorders or anemia should be analyzed. Appropriate labs include a CBC with differential, reticulocyte count, B12/folate levels, coagulation factors with additional studies of platelet function and specific clotting factors as needed. Preoperative planning should be multidisciplinary, and focus on minimizing intraoperative blood loss while maximizing preoperative hemoglobin levels. Young healthy adults show cognitive and cardiac changes at hemodilution levels resulting in hemoglobin of 5-7 g/dL; patients undergoing surgery under bloodless protocols demonstrate increased postoperative morbidity and mortality at hemoglobin concentrations <8.0 g/dL [3]. Animal data shows onset of myocardial ischemia (demonstrated by ST changes on EKG) at a hemoglobin concentration of <5 [3]. Measures to promote hematopoiesis include supplementation of iron, vitamin C and B12 and folic acid as well as exogenous epoetin and androgen therapy, granulocyte colony-stimulating factors, steroids and interleukin-11 [4,5]. EPO treatments combined with IV iron supplementation can magnify red-blood cell production fourfold [4]. To maximize RBC mass preoperatively, it is suggested Epogen doses at 600 U/kg weekly for 3 weeks prior to surgery or 300 U/kg daily for 10 days prior and 4 days after surgery.

In emergency situations, the patient should receive 300 U/kg daily for 2 weeks postoperatively [3]. Clotting factor deficiencies should be corrected with vitamin K and recombinant clotting factors. Specific considerations for the anesthesiologist include safe alternatives to general anesthesia as well as means of maintaining normothermia and normovolemia (without excessive hemodilution) intraoperatively. Additionally, some patients may be candidates for autologous blood donation. Drawbacks to preoperative autologous donation include increased likelihood of transfusion and, as autologous blood are often transfused as whole blood, increased risk of circulatory overload [4]. Intraoperatively, an ever-widening array of surgical hemostatics, sealants and adhesives can improve perioperative hemostasis [6]. The extent to which this degree of preoperative management has been implemented is debatable. A 1997 survey sent to 1,000 U.S. hospitals revealed relatively low use of preoperative pharmaceutical therapy to improve blood counts (EPO was used routinely in 11% of responding hospitals, and occasionally in 9%) [4]. Few follow-up studies of utilization in the United States are available at this point, but international experiences shed some light on the last decade's advances in bloodless surgery. 1407 bloodless patients in South Korea were grouped based on preoperative hemoglobin; those with low preoperative hemoglobin (<7) were more likely to require erythropoietin and iron supplementation; this group nonetheless saw higher mortality rates, particularly in those patients for whom preoperative supplementation failed to significantly boost their hemoglobin level [7]. However, retrospective cohort studies from Spain and Australia suggest that bloodless techniques can be implemented both for cardiac and noncardiac surgeries without significant differences in morbidity or mortality [8,9]. As bloodless surgery becomes increasingly mainstream, we can aspire to see this level of coordinated patient care take root and influence preoperative care more broadly as 'bloodless' procedures evolve in such diverse fields [10,11].

### References

1. Martyn V, Farmer SL, Wren MN, Towler SC, Betta J, et al. (2002) The theory and practice of bloodless surgery. *Transfus Apher Sci* 27: 29-43.
2. Brooks JP (2012) Management of acutely bleeding patients who refuse blood transfusion. *ISBT Science Series* 7: 29-33.
3. Carson J (2005) The limits of bloodless surgery. *Transfus Alt Transfus Med*. 6: 52-55.

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4. Shander A (2003) Surgery without blood. Crit Care Med 31: S708-714.
5. Hofmann A, Farmer S, Towler SC (2012) Strategies to preempt and reduce the use of blood products: an Australian perspective. Curr Opin Anaesthesiol 25: 66-73.
6. Spotnitz WD, Burks S (2012) Hemostats, sealants, and adhesives III: a new update as well as cost and regulatory considerations for components of the surgical toolbox. Transfusion 52: 2243-2255.
7. Jo KI, Shin JW, Choi TY, Park YJ, Youm W, et al. (2012) Eight-year experience of bloodless surgery at a tertiary care hospital in Korea. Transfusion .
8. Harwin SF, Pivec R, Johnson AJ, Naziri Q, Mont MA (2012) Revision total hip arthroplasty in Jehovah's Witnesses. Orthopedics 35: e1145-1151.
9. Reyes G, Nuche JM, Sarraj A, Cobiella J, Orts M, et al. (2007) [Bloodless cardiac surgery in Jehovah's witnesses: outcomes compared with a control group]. Rev Esp Cardiol 60: 727-731.
10. Nagarsheth NP, Sasan F (2009) Bloodless surgery in gynecologic oncology. Mt Sinai J Med 76: 589-597.
11. Courtney JB, Cushner F, Long WJ, Nett MP (2011) An effective bloodless surgery protocol. Tech Knee Surg. 10: 188-197.