# Chapter 16: Preoperative Autologous Donation

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## BACKGROUND

This chapter focuses on preoperative autologous donation (PAD). PAD refers to the donation of blood by a patient for their own future use; generally, this is for a scheduled elective surgery. The top three procedures associated with a request for a PAD are total hip replacement, total knee replacement and hysterectomy.[1]

There are other types of autologous blood use (e.g., acute normovolemic hemodilution and intraoperative and postoperative blood salvage) which are not discussed in this chapter.

Autologous and directed donations should be confined to circumstances of rare blood types[2] or plasma protein deficiencies in which allogeneic blood components may not meet patient needs. In all other cases, allogeneic blood transfusions are a safe option. See Chapter 13 of this *Guide* for more information on directed donations for neonatal and pediatric transfusion.

## BENEFITS AND RISKS OF PAD

The appropriateness of transfused autologous blood components has not been studied in Canada. Only a few high-quality randomized controlled trials studying PAD have been published.[3] The 1997 Krever Commission recommended that PAD be made available to patients to reduce the risks of transmissible disease.[4] However, this recommendation may no longer apply. According to 2019 data, the residual risk estimates of a potentially infectious allogeneic donation in Canada are very low: 1 in 12.9 million donations for HIV (human immunodeficiency virus), 1 in 27.1 million donations for hepatitis C (HCV), and 1 in 1.38 million donations for hepatitis B (HBV).[5] In fact, there have been no cases of transfusion-transmitted HIV infection in Canada since the implementation of testing in 1985.[6]

The transfusion of an autologous blood component is not risk-free. PAD units should only be transfused if clinically indicated. In terms of risk of possible adverse effects to the patient, PAD has been associated with an overall 30% increased likelihood of additional transfusion need (autologous plus allogeneic)[7] and may increase the risk of perioperative anemia. Information about the additional need for allogeneic blood in those patients who were transfused with autologous blood has not been reported in Canada. The autologous donation process can result in donation reactions or complications at a rate as high as 12 times greater than with healthy allogeneic donors.[8] This is related to differences in the selection criteria between the two donation processes. Complications, such as receiving the wrong unit, bacterial contamination and transfusion-associated circulatory overload, may occur as readily with autologous units as with allogeneic units. See Chapter 10 of this *Guide* for more on adverse transfusion reactions.

In terms of risk to the system, the majority (80%) of autologous collections are not transfused to the patient and must be discarded.[1] Indeed, blood components collected as PAD cannot be moved to the allogeneic inventory as they do not necessarily meet the selection criteria for allogeneic donation.

Based on the reduced risks of transfusion-transmitted infection from allogeneic donations, potential adverse effects associated with PAD, and high discard rates of autologous donations, in 2018 the National Advisory Committee on Blood and Blood Products (NAC) recommended that PAD be limited to patients with rare phenotypes or those with multiple or rare blood group antibodies in which compatible blood is not readily available.[2] Therefore, the primary benefit of PAD may be confined to circumstances of rare blood cell antigen types or rare plasma protein deficiencies in which allogeneic units can not meet patient needs.

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## DECLINING USE OF PAD

Autologous collections, which are performed by blood operators (i.e., Canadian Blood Services and Héma-Québec) and in hospital-based collection sites, have decreased significantly across Canada. For Canadian blood operators, in 2007 there were over 5,000 annual PAD collections;[1] this number dropped to 5 collections in 2019, and only 2 collections in 2020. There has also been a decline in hospital-based PAD collection. Only two sites registered for PAD with Health Canada in 2020, and these sites have collected no units in recent years.

The reasons for the observed decrease in autologous blood component collection and use include a decreasing risk of transfusion-transmitted infections with allogeneic blood, decreasing blood loss with advances in surgical techniques, and increasing patient blood management (PBM) programs. PBM is defined as "the timely application of evidence-based medical and surgical concepts designed to maintain hemoglobin concentration, optimise hemostasis and minimise blood loss in an effort to improve patient outcome."[9] Widespread use of PBM principles has resulted in an overall decrease in transfusion rates in several countries, including Canada.[10] For example, from its allogeneic inventory, Canadian Blood Services distributed approximately 19 red blood cell units per 1,000 population in the 2019–2020 fiscal year, representing a steady decrease since 2009–2010 (32 units per 1,000 population).[11,12]

## ELIGIBILITY FOR AUTOLOGOUS DONATION

The process for determining eligibility for autologous donations, as described below, applies to collections by blood operators in Canada. Hospital-based collection sites may have different processes for determining eligibility.

Physicians and surgeons refer potential autologous donors to the relevant blood operator. The request goes through an internal review process to determine if the patient meets the donor criteria as well as the evidence-based NAC recommendations[2] for PAD eligibility. The final decision to proceed with the autologous donation is at the discretion of the medical director of the blood operator.

There are no age limits for autologous donors. Informed consent of the patient/donor must be obtained in writing prior to initiating the donation series. The minimum weight requirement for autologous donors is 50 kg (110 lbs). Before the first donation, donors must have a minimum hemoglobin of 110 g/L and a minimum hematocrit of 33%. At subsequent donations, the minimum hemoglobin required is 105 g/L with a minimum hematocrit of 32%. A maximum of four donations can be collected from the donor/patient. The donations are normally drawn one week apart. Blood cannot be collected from a patient within 72 hours of the surgery. The majority of autologous donors donate one or two donations.[1] Initiation of iron therapy to return the hemoglobin to the pre-donation level is advised, but this is often not done; only 8% of autologous donors were found to be on iron therapy.[1]

## INDICATIONS AND CONTRAINDICATIONS

Autologous collection should be considered in patients meeting the 2018 NAC recommendations only if the chance of requiring a transfusion exceeds 10%. Patients with low-risk surgeries that rarely require blood should not be considered for a PAD.

Absolute contraindications for autologous donation include:

- idiopathic hypertrophic sub-aortic stenosis
- aortic stenosis
- left main coronary artery disease

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- unstable angina
- cardiac failure
- myocardial infarction within six weeks of a donation date
- atrioventricular block
- evidence of infection or risk of bacteremia, such as indwelling urinary catheter.

## MANUFACTURING AND TESTING OF AUTOLOGOUS PRODUCTS

Whole blood is collected in citrate-phosphate-dextrose (CPD) anticoagulant and processed into red blood cell units using the B2 method (see Chapter 2 of this *Guide*). Plasma is available only upon special request prior to donation. Autologous whole blood is not available.

Each PAD is tested for the same transfusion-transmitted infection (TTI) markers as for allogeneic collections (see Chapter 6 of this *Guide*). Any PAD unit testing positive on confirmatory tests for infectious markers other than syphilis will be destroyed and the donor deferred from continuing the autologous collections. Units testing positive on confirmatory tests for syphilis are still safe for autologous use, and donors with a remote history of hepatitis B who are HBsAg negative may donate with medical director approval but these donations are labelled as biohazardous for regulatory reasons. Units that have false positive or indeterminate TTI testing results are acceptable for use.

## CONTINUING PROFESSIONAL DEVELOPMENT CREDITS

Fellows and health-care professionals who participate in the Canadian Royal College's Maintenance of Certification (MOC) Program can claim the reading of the *Clinical Guide to Transfusion* as a continuing professional development (CPD) activity under Section 2: Self-learning credit. The reading of one chapter is equivalent to two credits.

## SUGGESTED CITATION

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If you have questions about the *Clinical Guide to Transfusion* or suggestions for improvement, please contact us through the Clinical Guide feedback form.

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