

Proposed guidelines for platelet transfusion

Physicians can optimize patient outcome and ensure appropriate use of a limited blood supply by following transfusion guidelines.

ABSTRACT: The decision to use platelet products should be based on a careful review of the patient's condition and clinical situation. As well as considering the most up-to-date guidelines provided by the British Columbia Provincial Blood Coordinating Office, the physician should consult with an expert in transfusion medicine.

Note: An earlier version of these guidelines has been published on the Bloodlink BC web site.

The guidelines that follow are proposed to support physicians in their clinical decisions related to the appropriate use of platelet products. They are not intended to provide a rigid prescription for care and do not replace the need to consult with an expert in transfusion medicine. The decision to transfuse platelets should be based on the judgment of the attending physician after careful review of the patient's condition and clinical situation. The goal is to optimize patient outcomes and to ensure appropriate use of the allogeneic (donor) blood supply. These guidelines apply to platelet transfusion in adults and are generally applicable to children with the exception of neonates.

These guidelines are periodically updated and are available electronically on the British Columbia Provincial Blood Coordinating Office web site (www.bloodlink.bc.ca). Prescribing physicians should refer to the most current version of these guidelines.

General considerations

- Informed consent is required for the transfusion of platelets.
- The cause of thrombocytopenia *must* be established prior to platelet transfusion. This is critical as plate-

let transfusions are not indicated in all cases and may be contraindicated for certain conditions, such as heparin-induced thrombocytopenia and thrombotic thrombocytopenic purpura/hemolytic uremic syndrome.

- Once the cause of thrombocytopenia has been established, the decision to transfuse platelets should not be based solely on the patient's platelet count. The decision to transfuse should be supported by the need to prevent or treat bleeding.
- Platelet transfusion should be given only after the risks associated with transfusion have been considered and only when the benefits outweigh the risks. Risks include the general risks of transfusion. The physician should also keep in mind that the risks of bacterial contamination (1:10 000) and alloimmunization to platelets are increased with platelet transfusion.¹

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- Strategies should be undertaken to minimize the need to transfuse platelets. For example:
 - Investigate, diagnose, and treat previously recognized thrombocytopenia.
 - Discontinue anticoagulants and antiplatelet agents before planned surgery.
 - Use adjunctive agents in specific situations (e.g., desmopressin, anti-fibrinolytics).
- Ensure that all other coagulation parameters are checked as well.
- When platelets are transfused, the reasons for the transfusion should be clearly and accurately recorded in the patient's chart and in any documentation used in ordering or administering platelets.

Platelet products

Platelets have a shelf life of 5 days and are stored at 20°C to 24°C with continuous gentle agitation.² Because platelets have a limited shelf life, platelet products are often in short supply. Most hospitals do not routinely stock platelets, so the transfusion medicine laboratory should be forewarned, whenever possible, of anticipated platelet requirements. Different platelet products exist, of which the most commonly used are as follows:

- Random-donor platelet unit: Each platelet unit contains at least 55×10^9 platelets suspended in 40 to 70 mL

of plasma.^{2,3} The typical platelet prescription is 10 mL/kg to a maximum of five random-donor platelet units. Note that each platelet unit is derived from a different donor.

- Single-donor apheresis platelet unit: Each apheresis platelet unit contains at least 300×10^9 platelets suspended in 200 to 400 mL of plasma and is derived from a single donor.^{2,3} Apheresis platelet units are preferred when a patient becomes refractory to random-donor platelet units, though the use of single-donor apheresis platelet units as first-line platelet products is increasing.

Response to platelet products

Typically one unit of random-donor platelets should increase the platelet count of a 70 kg adult by $5 \times 10^9/L$.³ Response to platelet transfusions should be assessed by obtaining a platelet count 15 minutes to 1 hour posttransfusion and calculating the corrected count increment (CCI) as shown in the **Figure**.

ACCI of >7.5 at 1 hour after transfusion or >4.5 at 20 to 24 hours after transfusion is considered acceptable. Platelet refractoriness is defined as the failure to achieve an expected CCI after two consecutive transfusion episodes.⁴ Patients who are refractory should be assessed further by a transfusion medicine specialist or hematologist.

Threshold and target platelet levels in the prevention of bleeding

As a general guide, the platelet count thresholds shown in the **Table** should be used for considering platelet transfusion.^{4,5} Serious spontaneous bleeding is unlikely to occur at platelet counts $>10 \times 10^9/L$. More specific recommendations are presented in the following sections.

For patients undergoing cardiopulmonary bypass surgery

The pathophysiology of platelet dysfunction in cardiopulmonary bypass (CPB) surgery has not been elucidated. Platelet-related bleeding includes microvascular bleeding as indicated by continued oozing from surgical incisions and venous cannulation sites. The platelet count following CPB gives no indication of platelet function. Thus, platelet transfusion may be considered in patients who are experiencing excessive postoperative bleeding and in whom a surgical cause has been excluded. Consideration for transfusion should also be given to those patients who have recently received antiplatelet agents. Intraoperatively, autologous platelet harvest may be used. There is no role for prophylactic platelet transfusion in CPB.⁴

For patients with platelet dysfunction

Acquired causes of platelet dysfunction include the use of antiplatelet agents (e.g., ASA, clopidogrel) and renal disease. The platelet count is less useful in these situations and the decision to transfuse should be based on clinical circumstances. The following recommendations⁴ should be implemented in order to avoid platelet transfusion if possible:

- Discontinue drugs with antiplatelet activity.
- Consider the use of desmopressin in

$\text{CCI} = \frac{(\text{posttransfusion platelet count} - \text{pretransfusion platelet count}) \times \text{body surface area}}{\text{total number platelets transfused}}$	
<p>Units:</p>	
pretransfusion platelet count ($\times 10^9/L$)	body surface area (m^2)
posttransfusion platelet count ($\times 10^9/L$)	total number of platelets transfused ($\times 10^9/L$)

Figure. Corrected count increment (CCI) calculation.

Table. Platelet count thresholds for platelet transfusion.

Setting	Platelet count
Neurosurgery CNS trauma	$<100 \times 10^9/L$
Epidural catheter insertion or removal	$<50 - 80 \times 10^9/L$
Significant microvascular bleeding Surgery Lumbar puncture	$<50 \times 10^9/L$
Vaginal delivery	$<50 \times 10^9/L$
Thrombocytopenia with fever or coagulopathy	$<20 \times 10^9/L$
Thrombocytopenia due to marrow failure	$<10 \times 10^9/L$

patients taking ASA, as well as patients with uremia and other congenital and acquired causes of platelet dysfunction.

- Correct the hematocrit to >0.30 in patients with renal failure; consider the use of desmopressin and dialysis, which also have hemostatic benefits in this situation.
- Use platelet transfusions where the above methods are inappropriate or ineffective.

Patients with congenital platelet dysfunction must be managed in consultation with a hematologist.

For patients undergoing surgery and invasive procedures

Expert consensus and retrospective case series suggest that a platelet count of $>50 \times 10^9/L$ is sufficient for most invasive procedures, including gastroscopy and biopsy, insertion of indwelling lines, transbronchial biopsy, liver biopsy, laparotomy, or similar procedures.^{4,6,7} Platelet counts $>100 \times 10^9/L$ are recommended for neurosurgery or ocular surgery.⁴

For adults and children, most experts recommend platelet counts of

$>50 \times 10^9/L$ prior to lumbar puncture as platelet counts $<20 \times 10^9/L$ have been associated with increased risk of hematoma or traumatic tap.^{6,8,9} No clear minimum platelet count has been identified for the insertion of epidural catheters, with published recommendations ranging from $>50 - 80 \times 10^9/L$.^{4,10,11}

Vaginal delivery can be performed safely with maternal platelet counts $>50 \times 10^9/L$,¹² as hemostasis after placental separation is largely mechanical.

Bone marrow biopsy can be performed safely without platelet support if adequate surface pressure is applied.⁴

Posttransfusion platelet counts should be obtained before any invasive procedure. Platelets should be available for transfusion if bleeding complications arise.

For critically ill patients with thrombocytopenia

No specific data exist regarding transfusion thresholds in the critically ill. The following recommendations are extrapolated from data in patients with acute leukemia. For patients who are critically ill with fever, sepsis, or coagulopathy, the platelet count should be maintained above $20 \times 10^9/L$. If there is significant bleeding, the platelet count should be maintained above $50 \times 10^9/L$.

For patients with thrombocytopenia due to chronic marrow failure

The role of prophylactic platelet transfusion in patients with chronic stable thrombocytopenia due to myelodysplastic syndrome or aplastic anemia is unclear, as many patients do not experience serious hemorrhagic complications with platelet counts $<5 - 10 \times 10^9/L$. Long-term prophylactic platelet transfusion is associated with transfusion risks, including alloimmunization. Maintaining a platelet count of

$>10 \times 10^9/L$ in patients without other risk factors such as fever or coagulopathy is considered safe. Maintaining a lower threshold of $5 \times 10^9/L$ or withholding prophylactic transfusion may be appropriate in selected stable patients. Hemorrhage should be treated with platelet transfusion.⁴

For patients with leukemia or undergoing hematopoietic stem cell transplantation

Patients with acute leukemia (excluding acute promyelocytic leukemia) commonly require platelet transfusion support throughout their treatment course. Several studies have provided evidence that the threshold for prophylactic platelet transfusion can be lowered to $10 \times 10^9/L$.^{4,13-15} This threshold is similar for hematopoietic stem cell transplantation. If the patient has fever, sepsis, disseminated intravascular coagulopathy, or minor bleeding, the platelet count should be maintained above $20 \times 10^9/L$.^{4,14,16}

Though there are no specific studies for patients with acute promyelocytic leukemia, patients with this form of leukemia who have a concomitant coagulopathy should receive prophylactic platelet transfusion to maintain a platelet count $>20 \times 10^9/L$.⁴

For patients with acute blood loss resulting from trauma

A decrease in the platelet count to $50 \times 10^9/L$ is expected when red cell concentrates equivalent to two blood volumes have been transfused. In patients with acute bleeding, the platelet count should be maintained above $50 \times 10^9/L$.^{4,17} If injuries include multiple trauma or CNS injury, published recommendations suggest a target platelet count of $100 \times 10^9/L$.^{4,18} In practice, however, local experience suggests that a count of $75 \times 10^9/L$ as a target is more realistically achievable in the context of finite platelet resources.

For patients with immune thrombocytopenic purpura

Platelet transfusions are often ineffective in immune thrombocytopenic purpura (ITP) and should be reserved for patients with life- or limb-threatening bleeding, in which case platelets should be maintained above $50 \times 10^9/L$. Patients with ITP with a platelet count $<10 \times 10^9/L$ should be transfused *only* in the setting of serious bleeding. In the rare circumstances when platelet transfusion is required in the management of ITP, other therapies such as corticosteroids and/or intravenous immunoglobulin should be given at the same time to enhance platelet survival.⁴

Contraindications

Platelet transfusions are contraindicated in thrombotic thrombocytopenic purpura/hemolytic uremic syndrome (TTP/HUS) and heparin-induced thrombocytopenia (HIT) unless there is life- or limb-threatening hemorrhage. Platelet transfusions have been associated with exacerbation of TTP/HUS and arterial thrombosis in HIT.⁴

Competing interests

None declared.

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