Government of Newfoundland and Labrador

Department of Health and Community Services
Provincial Blood Coordinating Program

MASSIVE HEMORRHAGE PROTOCOL IN ADULTS	NLBCP-051

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Overview

A Massive Hemorrhage Protocol (MHP) is a protocol developed to ensure rapid recognition, response, and intervention to care for those patients experiencing a massive hemorrhage event. A MHP is activated when the health care provider anticipates the hemorrhage event will require massive transfusion support.

Hemorrhage accounts for approximately 50% of deaths within 24 hours of a traumatic injury and up to 80% of intraoperative trauma-related deaths. The majority of significant hemorrhage cases are trauma, surgical, and obstetrical. A Massive Hemorrhage Event (MHE) is the transfusion of a volume of blood components equivalent to a patient's estimated total blood volume within a 24 hour period. This approximates 10 units or more packed red blood cells (RBCs) in adults. Other definitions include 50% loss of total blood volume within 3 hours (one blood volume is approximately 5000mL or 70mL/kg in a 70 kg adult); blood loss at a rate greater than 150 mL/minute; or blood loss requiring four units of RBCs in a four hour time period.

Achieving hemostasis to minimize blood loss and the need for transfusion of blood components and products is the primary goal during a massive hemorrhage event.

The Canadian National Advisory Committee on Blood and Blood Products (NAC) supports a 'three strategy approach' to transfusion support in trauma patients at risk for massive hemorrhage. The strategy includes:

1. Early administration of tranexamic acid, preferably within the first 3 hours after injury.
2. Immediate administration of a 'foundation ratio' based on a 1:1 ratio of RBCs: frozen plasma (FP) with platelets (if ordered).

Note: A foundation ratio is a pre-set standardized ratio as outlined in facility policy.

3. Assessment and further transfusion(s) as supported by the patient's clinical status and laboratory tests results.

Alternative treatments such as heparin reversal, warfarin reversal, antifibrinolytics and Desmopressin (DDAVP) should be considered where appropriate.

The "lethal" triad for patients experiencing traumatic hemorrhage is a result of the effects of coagulopathy, hypothermia, and acidosis.

Coagulopathy occurs shortly after injury; often before the patient is admitted and resuscitation and treatment commences. Reports indicate that trauma induced

coagulopathy occurs in approximately 25% of patients independent of acidosis and hypothermia. Patient groups with a pre-disposition to coagulopathy should be recognized as early as possible. Examples include patients with chronic renal failure, hereditary bleeding disorders, or patients on antiplatelet or anticoagulant medications.

Hypothermia increases the risk of multiple organ failure and coagulopathy. Hypothermia may be prevented by using patient warming devices, blood warmers and by pre-warming resuscitation fluids.

Acidosis may occur due to poor oxygen delivery and may be worsened by hypothermia.

Calcium replacement is very important to maintain hemostasis. Citrate toxicity must be monitored regularly by testing ionized calcium levels. Citrate is metabolized to bicarbonate which can lead to metabolic alkalosis. Citrate in blood products binds calcium and magnesium; over time the body's ability to metabolize citrate can be affected.

Summary of treatment priorities:

1. Achieve hemostasis and correct coagulopathy.
2. Maintain tissue perfusion and oxygenation by restoring circulating volume.
3. Prevent hypothermia, hypovolemic shock and multiple organ failure.
4. Mitigate citrate toxicity and metabolic alkalosis.

*Note: Despite instituting MHP, it is very important to use the specialized assessment skills of the team and to view each patient as unique. The MHP should be used as a tool to provide guidelines for treatment and should not be a replacement for thorough patient assessment. Alternate therapies may be required during the resuscitation process.

Policy

1. The Regional Health Authorities (RHAs) shall have:
   1.1. Procedures in place to allow early identification of adults who may require activation of a MHP.
   1.2. Processes in place to ensure appropriate communication of information surrounding the massive hemorrhage event (example, Emergency Medical Service relaying information to the receiving facility).

2. The RHAs shall establish and maintain policies outlining actions to be taken when a MHP is implemented.
3. The transfusion services Medical Director shall establish a policy for abbreviated serologic testing when a massive transfusion is required.
4. Transfusion medicine laboratories (TMLs) shall have processes in place for the release of blood and blood components before pre-screening is completed; whereby a delay in transfusion may negatively impact the patients' outcome.

Procedure

Physician Responsibilities

A massive hemorrhage event should be declared once a full patient assessment has been completed and it is anticipated that the patient will require a massive transfusion.

1. Physical assessment should include:
   - 1.1. The cause and rate of hemorrhage;
   - 1.2. The patient's current physiological status;
   - 1.3. A health history, when possible, to deem whether or not the patient is at increased risk for hemorrhage due to a pre-existing condition (such as congenital or acquired bleeding disorder) or due to medication regime (such as antiplatelet or anticoagulant drugs);
   - 1.4. The following blood tests should be ordered and sent with STAT priority: type and screen, complete blood count (CBC), international normalized ratio (INR), partial thromboplastin time (PTT), fibrinogen, electrolytes, creatinine, ionized calcium, magnesium, lactate, and arterial blood gas (subject to facility capability); and,
   - 1.5. If a massive hemorrhage event is declared, the physician will activate the MHP. To minimize miscommunication, each MHP should be managed by the assigned clinical person (typically a RN) and coordinated with one TML Medical Laboratory Technologist (MLT).
2. Consult any necessary medical/surgical services.
3. Initiate Hematology Consult if indicated.
4. Identify the assigned clinical person to handle all communications regarding laboratory results and requests for blood.
5. Ordering of blood components and blood products as clinically indicated (ongoing throughout the MHP).

6. Discontinue MHP when bleeding is under control or ceased.

   Note: After initial transfusion management, the need for further blood components and/or blood products is guided by laboratory results in conjunction with clinical presentation of the patient. Laboratory results to be assessed every 30-60 minutes include but are not limited to: CBC, INR and fibrinogen.

Nursing Responsibilities

1. Notify the TML of the MHP and:
   1.1. Name of the assigned clinical person.
   1.2. The nature of the bleeding event.
   1.3. Patient history including any known pre-existing coagulopathy.
   1.4. Name of the physician who is initiating the protocol and who will be responsible for all ordering of blood products/components.
2. Collect, label, and send all ordered blood specimens to the laboratory.
3. Notify TML of any additional required blood components/products that need to be ordered (as per designated physician).
4. Notify TML when the MHP has been discontinued.

The TML MLT Responsibilities

1. Designate a contact person for the MHP.
2. Notify Canadian Blood Services (CBS) by phone, as soon as the MHP is activated so that blood inventories may be adjusted by CBS to maintain baseline inventories.
3. Notify other laboratories (hematology, coagulation, chemistry).
4. Monitor utilization of blood components and blood products.
5. Notify CBS and all other laboratories that the MHP has been discontinued.

Selection of Blood Components

1. Group O RBCs and Group AB frozen plasma should be used if transfusion is required while awaiting results of the blood group testing.
2. Rh (D) negative units shall be given to all women of childbearing potential (45 years and under).
3. Transfuse group specific units when the recipient's specific group is confirmed.
4. If group specific components are not available, blood component substitutions will be necessary, see Blood Component Substitutions for clinically accepted substitutions.

Selection of Blood Components for Transfusion

1. Red Blood Cells

   1.1. The goal is to maintain hemoglobin of 70 to 100 g/L. Order up to 6 units RBCs to begin. Transfuse group O until group specific is ready. Use Rh (D) negative, if possible, for women of childbearing age, or for children. Switch to group specific blood components as soon as possible depending upon blood bank inventory [initiate cell salvage if it is an option].

2. Frozen Plasma

   2.1. The goal when transfusing frozen plasma is to maintain INR less than or equal to 1.7 g/L or to achieve adequate microvascular hemostasis. The initial adult dose is 500 to 1500 mLs. Transfuse group AB frozen plasma if the blood group of the patient is unknown.

3. Platelets

   3.1. The goal when transfusing platelets is to maintain a platelet count greater than 50 x 10^9/L or greater than 100 x 10^9/L in those with CNS trauma or known platelet dysfunction. One adult dose is equivalent to one buffy coat pool or 1 unit of apheresis platelets.

4. Rh Immune Globulin (RhIg)

   4.1. RhIg should be administered to patients who are Rh(D) negative who have received Rh(D) positive platelets after the patient no longer requires further blood components, and provided the patient has not received Rh(D) positive RBCs. The recommended standard dose is 300µg.

5. Fibrinogen Concentrate/Cryoprecipitate

   5.1. The goal is to maintain a fibrinogen level greater than 1.5 g/L.

   5.2. If the fibrinogen level is less than 1.5 g/L and the INR is greater than or equal to 1.7 transfuse frozen plasma or consider fibrinogen concentrate or cryoprecipitate.

   5.3. Recommended standard dose of fibrinogen concentrate is 2 to4 g.

   5.4. One adult dose of cryoprecipitate is 10 units or 1 unit / 5kg body weight, to a maximum of 10 units per dose. This product requires 25 to 30 minutes to thaw and issue.

   Note: In an obstetrical massive hemorrhage event, more aggressive fibrinogen replacement should be considered if fibrinogen less than 2.0 g/L.

Physician Additional Treatment Options

Antifibrinolytics and Procoagulant Medications:

1. Consider treatment with antifibrinolytics or procoagulant medications if the patient continues to bleed.
   1.1. Antifibrinolytics
      1.1.1. Antifibrinolytics such as Tranexamic acid and DDAVP are used to control bleeding. Initial research has indicated a safer side effect profile with decreased thromboembolic risks when compared to other treatments such as Recombinant Factor VIIa (rFVIIa).
      1.1.2. Tranexamic acid should be administered within the first three hours after injury as a 1gram IV bolus, followed by infusion of 1 gram over the next eight hours.
      1.1.3. DDAVP may be administered 10mcg/mg IV to a maximum dose of 20 mcg.
   1.2. Prothrombin Complex Concentrates
      1.2.1. Prothrombin Complex Concentrates may be considered for the reversal of Vitamin K antagonists or for treatment of Vitamin K deficiency in patients exhibiting major bleeding.
      1.2.2. The recommended adult dose is INR dependent and may be up to 3000 international units of Factor IX, along with Vitamin K1 10 mg intravenously.
      1.2.3. The INR should be re-tested within 10 to 30 minutes of administration. A higher or second dose may be required in extreme conditions.
   1.3. Recombinant Factor VIIa
      1.3.1. Note: rFVIIa should only be considered in rare cases after all other measures have been used and there is a likelihood that the patient will survive. The risk of harm outweighs the evidence of benefit for rFVIIa use in these instances.
      1.3.2. rFVIIa is administered 0.020 to 0.050 mg/kg IV direct.

Ongoing clinical monitoring of patient

1. Continue to monitor patient status, ensuring to monitor for signs and symptoms of Adverse Transfusion Events as per facility policy.
2. Bloodwork may need to be completed routinely at 30 to 60 minutes intervals as ordered by the physician overseeing the MHP.
3. Determine transfusion strategy if bleeding persists. If the patient has received more than 20 components, consult Hematology, if not previously consulted.

4. If bleeding is under control or ceased, MHP can be ended as determined by the managing physician. **Once ended, the nurse should notify the assigned MLT, who should notify CBS that the Massive Hemorrhage Protocol has ceased.**

Adverse Transfusion Events (ATE) and Complications

ATE: Recipients of massive transfusion are at a greater risk of experiencing an adverse transfusion event. Monitor for signs and symptoms of ATE as per facility policy. Common complications experienced as a result of a massive transfusion include:

- Transfusion associated circulatory overload (TACO)
- Dilutional coagulopathy
- Hypomagnesemia
- Hyperkalemia
- Hypothermia
- Hemorrhagic diathesis
- Acidosis
- Thrombocytopenia
- Hypocalcemia
- Thromboembolic events
- Disseminated intravascular coagulation (DIC)

Quality Control

Quality and Risk Management shall conduct a debriefing with all appropriate clinical and laboratory staff to review the following aspects of implementation of the MHP:

1. Patient outcome;
2. Staff performance during the event;
3. Effectiveness of communication strategies;
4. Response time;
5. Strengths and weaknesses of actions taken; and,
6. Suggestions to improve management of future massive hemorrhage events.

Documentation/Records Management

All records of transfusion shall be retained in the recipient's medical chart in accordance with the facility's retention for medical records. See Records Retention for Transfusion Medicine Documents.

Key Words

Massive hemorrhage, bleeding.

Supplemental Materials

Massive Hemorrhage Protocol in Adults Flowsheet

References

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