MEDAVIE HealthEd ÉduSanté

Administration of Blood Products

Advanced Care Paramedicine

Module: 04

Section: 07c

Objectives

- Description and indication for blood products
- Blood typing and crossmatching
- Possible complications of transfusions
- Administration and documentation
- Issues specific to Paramedics (and more about making the decision to transfuse RBC's)

Objective 1:

- Description and Indication for Blood Products
- Whole blood
- Red Blood Cells
- Platelets
- Fresh frozen plasma
- Cryoprecipitate

2 types of donations

- Whole Blood donation: about 450 mL of blood is taken from the donor, then typically processed into RBC, FFP, and random donor platelets. (normal cases)
- Apheresis donation: blood taken from donor for only one component (eg platelets). The blood minus the platelets is infused back into the donor. (special cases)

Whole Blood

- Contains about 450 mL of donated blood plus 63 mL of anticoagulant
- Rarely used and not typically produced by CBS because Red Blood Cells are usually more appropriate for the anemic or hemorrhaging patient
- Donor and recipient must be the same blood type (eg. Both A, both B, both O, etc)

Red Blood Cells

- Using a whole blood donation, most of the plasma is removed from the unit (unlike the whole blood donation).
- AS-3 is added as nutrient to extend the shelf life to 42 days.
- Leukocytes are reduced during processing.
- Concentrated red blood cells with a volume of 260 – 340 mL. 80% of the volume is red blood cells.

Red Blood Cells, con't

- Indications:
  - Anemia (chronic or acute), hemorrhage
    - This is to replace oxygen-carrying capacity of the blood (to increase the hemoglobin level).
    - RBC transfusion is not to be used to replace volume when oxygen-carrying capacity is adequate.
    - RBC units will not supply platelets, clotting factors, WBC's, or plasma.

Platelets

- Random donor platelets made from whole blood donations are platelets suspended in about 50 mL of plasma.
- Apheresis platelets come in a larger bag (can be up to or exceed 400 mL).
- Indications: low platelets as determined by lab testing. (eg. Cancer patients, etc)

Blood donations

- Canada's blood supply is one of the safest in the world
- Canadian Blood Services (CBS) supplies the blood products for Canada (except Quebec)
- CBS follows federal regulations and adheres to protocols very strictly to assure the quality of the blood products

Fresh Frozen Plasma

- Separated from the other components of blood and frozen within 8 hours of donation.
- FFP is for replacement of plasma proteins including all clotting factors. It also has volume expansion and oncotic properties.

Cryoprecipitate

- A special blood product made from FFP. Supplies larger quantities of Factor VIII and fibrinogen
- Very specific indications such as patients with hemophilia and von Willebrand's disease.

Objective 2:

- Blood Typing and Crossmatching

Blood Type

- ABO system is most important: A, B, AB, and O. Genetically determined and doesn't change.
- The Rh system involves many antigens, but we just worry about the "D" antigen. When we say "Rh negative", that means no D antigen. When we say "O NEG" we mean Group O, Rh negative.

Antigens

- Proteins on the surface of red blood cells. The presence or absence of antigens as determined by lab testing tells us the blood type. This testing is important for both patients and donor blood.

ABO system

- Group A blood = A antigens, no B antigens
- Group B blood = B antigens, no A antigens
- Group O blood = No A or B antigens
- Group AB blood = Both A and B antigens

Antibodies

- Proteins in the blood that have been produced by lymphocytes as part of the defense against foreign substances. If a foreign protein gets into the blood, the body might recognize it as non-self and produce an antibody. Crossmatching and other pre-transfusion testing is for finding antibodies.

ABO system

- Group A blood
  - A antigens, no B antigens
  - Anti-B antibodies
- Group B blood
  - B antigens, no A antigens
  - Anti-A antibodies
- Group O blood
  - No A or B antigens
  - Anti-A and Anti-B antibodies
- Group AB blood
  - Both A and B antigens
  - No Anti-A or Anti- B

Transfusing RBC units

- Group A patient - can get A or O blood
- Group B patient - can get B or O blood
- Group O patient – can only get O blood
- Group AB patient – can get A, B, AB or O blood

BUT, If we don't know…

- If we don't know what type the patient is, then we must only give type O blood (and preferably O Rh Negative)
- (i.e. if we take blood to a trauma scene, or other pre-hospital setting)

Rh (D) type

- About 85 % of the population is Rh (D) positive.
- Very few Rh (D) negative people have Anti-D. Therefore O Rh Positive blood can be given in a dire emergency to someone with an unknown blood type.
- However, it is preferable to give O Rh Negative blood when the blood type is unknown.

Crossmatch

- Pre-transfusion testing in the blood bank lab (transfusion medicine lab) involves looking for antibodies in the patient and then matching patients with donor red blood cell units.
- Platelets, FFP, etc are not “crossmatched” (only RBC and whole blood)
- It is more risky to transfuse Uncrossmatched blood.

Objective 3:

- Possible Complications of Transfusions

Risks of Blood Transfusion

- Risks occur with every unit transfused:
  - Disease transmission
    - Testing does not totally eliminate the risks of virus or bacteria transmission
  - Tranfusion Reaction
    - The crossmatch, plus careful attention to transfusion tags and patient identification decreases the chance of a transfusion reaction.
    - Pre-Hospital: uncrossmatched: Group O only

Transfusion Reaction

- Any adverse event occurring in a recipient of blood or blood products which may have been caused by the transfusion

Immune Hemolytic Reaction

- Can be immediate or delayed
- Immediate type:
  - can be from ABO incompatibility, or non-ABO antibodies
  - Lumbar pain, fever, hypotension, hemoglobinuria, anxiety, shock, DIC, death
- Delayed type:
  - Drop in hemoglobin, hematuria, fever, less severe

Tx for Hemolytic Reaction

- STOP the transfusion. DO NOT discard the rest of the product. Keep it for lab testing.
- Maintain the IV site by changing the tubing to a regular IV administration set with NS running. Aggressive IV therapy as needed to maintain BP.
- Double check unit identification tag with pt ID band.
- If on a transfer: Phone the receiving hospital so they can admit to ICU, and start investigation (repeating the crossmatch, other lab tests)

Febrile Reactions

- Febrile nonhemolytic reactions occur in approximately 1 % of transfusions
- Benign reactions that may be confused with immune hemolytic reactions. Protocols may require you to stop the transfusion if the temperature increases by 1 °C

Allergic Reactions

- In about 1% of all transfusions, the patient may present with S&S such as hives and wheezing.
- The transfusion should be slowed and the patient given diphenhydramine IV or IM. Remember that diphenhydramine cannot be added to the blood.
- Observe the patient for other signs. Stop the transfusion if other signs develop or the rash progresses. (? Anaphylactoid Reaction)

Anaphylactoid Reaction

- Occasionally, there is a life-threatening anaphylactoid reaction involving laryngeal edema and hypotension.
- STOP the transfusion.
- Treat the patient as you would treat for anaphylaxis.

Infectious Disease

- Even with the most up-to-date and sensitive testing techniques, the risk of virus transmission including HIV cannot be eliminated.
- This is something patients should be aware of when giving consent for a transfusion.

Bacterial Contamination

- Septic transfusion reactions are one of the most significant causes of transfusion-related morbidity and mortality.
- S&S: High fever and/or gastrointestinal symptoms.
- STOP the transfusion. Treat as required.

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- A very rare occurrence where the donor's blood has antibodies to the patient's cells.
- The patient will develop non-cardiogenic pulmonary edema.
- STOP the transfusion, give oxygen and support ventilation as needed.

Risks with Massive Transfusion

- With massive transfusion:
  - Hypothermia
  - Clotting problems
  - Electrolyte imbalance (Calcium or Potassium), pH changes

Objective 4:

- Administration and Documentation

Procedure for Administration

- Patient consent – verbal or written
- 170-260 micron filter in IV line (Y set)
- Charge the line with Normal Saline. It is the only fluid that can be mixed with blood.
- IV should be 18 G or larger (adults); 23 G or larger (peds).

Administration - preparation

- RN or paramedic signs blood out of blood bank lab (ID check – blood tag with lab report/ blood bank log book).
- At the bedside: another ID check – check transfusion tag with patient's wrist band
- Visual inspection of the blood
- Has the blood product expired?

Administration - starting

- Initial vital signs including temperature
- Once the unit is entered, the blood component expires in 4 hours
- Preferably, the maximum rate for the first 15 minutes should be 5 mL/minute
- The patient should be observed during this period

Administration – if there is a reaction:

- If the patient develops any signs or symptoms of a transfusion reaction, STOP the transfusion.
  - Replace the blood set with a regular IV line with normal saline
  - Re-check the identification of the tag versus the patient
  - Notify the blood bank, save the blood product
  - Re-assess the patient, give supportive treatment
  - Document all details on Patient Care Report

Documentation

- Tracking of every unit of blood is a very important aspect of the blood system.
  - After a transfer which involved carrying blood products for your patient, let the blood bank know what happened to each unit.
- Document thoroughly on PCR: unit #, blood type of unit, start time, finish time, whether there was an adverse reaction, vital signs, etc. (see module for a complete list)

Objective 5:

- Issues Specific to Paramedics
- Emergent Transfusions
- And
- In the field, how do I decide who gets transfused RBC's?

Emergent Transfusions (Hospital)

- In the hospital setting, blood would be drawn for crossmatch before any blood is given
- O Rh Negative RBC units if cannot wait for determination of blood group (takes 15-25 minutes)
- For plasma: AB Plasma only when blood type unknown.

Uncrossmatched Blood

- Uncrossmatched blood should be started slowly and the patient watched carefully for the first few minutes
- Uncrossmatched blood is a risky transfusion because you never know if they have some type of antibody.
- Crossmatch should be started ASAP.

Paramedics will encounter blood products in 2 situations:

- Pre-hospital (scene calls): O Rh Negative blood with no prior crossmatch
- Interfacility transfers: Blood type ABO compatible, crossmatch likely finished, physician might have made the decision to initiate the transfusion

Pre-Hospital Transfusion

- Today, transfusion on scene rarely occurs in Alberta
- O blood carried only
- No blood would be drawn prior; Uncrossmatched blood
- Don’t give Rh Positive blood to children or women of childbearing age

Interfacility Transfusion

- Use the proper Canadian Blood Services blood box with ice packs
- Always check the blood tag against the patient's identification (wrist band)
- Never use blood that was not intended for your patient
- Document thoroughly; Assess frequently

Who gets transfused RBC?

- Chronic anemia not treatable with pharmacology (iron, Vitamin B12, erythropoietin)
- **In acute anemia, a fall in hemoglobin values below 60 g/L or a rapid blood volume loss of more to 30% to 40% requires RBC transfusions in most patients

The decision to transfuse in pre-hospital care…

- Develop and follow local protocols as much as possible
- It might not be a black and white decision. It may need to be a case-by-case determination, weighing risks of the transfusion with the risks associated with the hemorrhage

Hemoglobin as a transfusion trigger

- Hemoglobin <60 g/L tend to be transfused
- Hemoglobin > 90 g/L tend not to be transfused
- ****Lab Hemoglobin level is meaningless in acute hemorrhage unless the volume has been replaced with crystalloids

Estimated blood loss as a transfusion trigger

- We do our best, BUT…Blood soaks into the ground, clothing/ towels, gets flushed down the toilet…. builds up in the bowels, pleural space, peritoneal space…(occult bleeding)
- Mechanism of injury can also be considered when making the decision to transfuse RBC's.

Clinical signs as a transfusion trigger will be useful for Paramedics….

- Heart rate, Blood pressure
- Mentation, level of consciousness
- Signs of Hemorrhagic Shock
  - Compensated Vs Uncompensated (if BP dropping, a transfusion is needed now, along with many other interventions including volume replacement with other fluids)

Basic principle for treating hemorrhage:

- For hypovolemic shock due to blood loss, infuse 2 – 3 boluses of 20 mL/ kg of crystalloids as required. Reassess after each bolus.
- If additional treatment is required, transfuse Red Blood Cells.

Pt NOT likely to require RBC transfusion:

- Single # (ribs, limbs)
- Vaginal birth without complications
- Routine C-section
- Iron deficient patient
- Single laceration with bleeding controlled

Pts who might need to be transfused with RBCs:

- Ruptured spleen from quad accident
- Multiple trauma with a severe mechanism of injury who has a distended abdomen
- Gunshot wnd or stab wnd in the thorax
- Major GI bleed, esophageal varices
- Severe post-partum hemorrhage
- Arterial bleed with significant blood loss

Stable patients who might benefit from RBC transfusion:

- Anemic cancer patient undergoing chemotherapy
- Anemic patient with Crohn's or colitis
- Severely iron-deficient female in a high-risk pregnancy
- Severe chronic anemia due to a bone marrow disorder

Blood Products - Summary

- Transfusion is a life-saving treatment, but the decision to transfuse should be made carefully with an awareness of the risks
- We must do all we can to reduce the risks of a transfusion reaction
  - Patient identification
  - Proper storage and handling of the blood

Remember:

- Normal Saline is the only fluid that can be mixed with blood!!