Transfusion Support for Obstetric Hemorrhage

Patricia M. Kopko, MD
Professor of Pathology
Director, Transfusion Medicine
UC, San Diego Health System
Overview

• Blood Products and Indications
• Blood Bank Testing
  – Type and Screen
  – Antibody Identification
  – Type and Cross
• Transfusion in Emergency Situations
  – Massive Transfusion Protocols
  – Emergency Release of Blood Products
  – Plasma
• Questions
Blood Products and Indications
Red Blood Cells - Indications

• Treatment of anemia in normovolemic patients who require increased oxygen carrying capacity and red blood cell mass
  – Hgb of < 7 g/dL in stable non-bleeding patients
  – Based on clinical condition of patient
  – May need to transfuse at higher Hgb in unstable patients

• Bleeding patients who have lost > 10% of their blood volume

• On average one unit of pRBCs will increase Hgb by 1 g/dL
Plasma - Indications

- Bleeding patients or patients undergoing invasive procedure with multiple coagulation factor deficiencies

- Emergent reversal of warfarin
  - Use Vitamin K when reversal is not emergent
  - Prothrombin complex concentrates (PCC) may be a better choice in emergent reversal – most likely carried by pharmacy

- Part of massive transfusion protocol
Plasma Transfusion

• The appropriate dose of plasma to correct an abnormal INR is 10 – 15 mL/Kg.
• In a 70 Kg patient this is 700 – 1,050 mL
• This is equivalent to 3 or 4 units of FFP
• Plasma take 30 – 45 minutes to thaw
• Plasma shelf life after thaw is 24 hours, but it can be converted to thawed plasma with a shelf life of 5 days
What is FP-24?

- Official name is Plasma Frozen Within 24 Hours of Phlebotomy
- By contrast FFP is frozen within 6 to 8 hours of phlebotomy, depending on collection method
- Manufacture of FP-24 is how many blood centers have complied with TRALI risk reduction measures
  - As of April 2014 plasma for transfusion must come from:
    - Males
    - Never pregnant females
    - Females who test negative for HLA antibodies
- FP-24 is used interchangeably with FFP
Plasma Frozen at 24 hours

- **Background**
  - FFP must be frozen within 8 hours of whole blood collection.
  - This requirement limits the production of frozen plasma at large donor centers.

- **Study Design**
  - CPD-WB collected from 10 donors.
  - 1 hr after collection, plasma sample collected and units divided in half
    - 1 stored at 4C and other stored at 22C for 8 hours
    - ½ units were returned to 4C storage for 16 hrs
    - Plasma samples were taken at 8 and 24 hrs and frozen -18C

Plasma frozen at 24 hours

• **Results**
  – No significant changes were noted in FV, FVII, FX, fibrinogen, AT III, protein C and S over 24 hrs.
  – FVIII levels
    • Decreased 13% at 8hrs (p<0.05)
    • Decreased 30% at 24hrs (p<0.05)

• **Conclusion**
  – For clinical situations not requiring the replacement of factor VIII only, 24-hour frozen plasma has properties comparable to those of FFP.

However, FVIII is an acute phase reactant and is usually not critical in correcting most coagulopathies (Prentice CRM, et al. Thromb Res 1972; 1: 493-506.)
Platelets - Indications

- Bleeding associated with thrombocytopenia (< 50,000/µL)
- Bleeding associated with abnormal platelet function (congenital or acquired)
- Prophylactic for surgery
  - < 50,000/µL for most surgeries
  - < 100,000/µL for surgery in enclosed spaces (CNS, ureter)
- Prophylactic for patients with platelet counts < 10,000/µL
- Prophylactic for patients with platelet counts < 20,000/µL on medications that affect coagulation
  - Aspirin
  - Lovenox
Platelet Transfusion

- In California, platelets are supplied as leukocyte reduced apheresis platelets
- Contain a minimum of $3 \times 10^{11}$ platelets per bag
- Equivalent of 6 – 10 platelet concentrates made from whole blood
- Single donor
- Should raise platelet count by 30,000 – 60,000
Cryoprecipitate

• Cryoprecipitate is made by thawing a unit of FFP at 1 – 6°C
• The cold insoluble material is refrozen
• Cryoprecipitate contains
  – Factor VIII:C
  – Factor VIII:VWF
  – Fibrinogen
  – Factor XIII
Cryoprecipitate - Indications

- Acquired or congenital Factor XIII deficiency
- Acquired or congenital fibrinogen deficiency
- Fibrinogen replacement in liver transplantation
- Fibrinogen replacement in massive transfusion
- Fibrinogen replacement in obstetric hemorrhage
- Is not indicated for factor VIII:C or VIII:VWF unless recombinant or virally inactivated products are unavailable
Cryoprecipitate Transfusion

- Supplied as single units or pools
- Pools typically have cryoprecipitate from 5, 8 or 10 units of whole blood
- A dose of cryoprecipitate is 2 pools of 5 or 1 pool of 8 or 10
- If you work at a hospital that delivers babies, your transfusion service should carry pools of cryoprecipitate
- It is much easier and quicker for anesthesia to check, hang and transfuse one or two bags of cryoprecipitate than 10
- If your transfusion service pools the cryoprecipitate, it can take much longer (45 – 60 min) to get it to the OR
- Don’t forget the cryo – if you have a patient that won’t stop bleeding try cryo!!!
Blood Bank Testing

• Type and Screen
• Antibody Identification
• Type and Cross
Type and Screen

• Perform ABO type
• Perform antibody screen to look for non-ABO antibodies
Antibody Screen

- Test can include 2, 3 or 4 different blood group O reagent red blood cells
- Overall, the cells in the test system must express D, C, E, c, e, M, N, S, s, P1, Le\textsuperscript{a}, Le\textsuperscript{b}, K, k, Fy\textsuperscript{a}, Fy\textsuperscript{b}, Jk\textsuperscript{a} and Jk\textsuperscript{b}
- Red blood cell clumping indicates the possible presence of clinically significant alloantibodies
- A positive antibody screen needs to be followed up with identification of the antibody
Antibody Identification

- Patient serum is tested against a panel of 8-14 reagent red blood cells with known antigenic composition.
- To identify an antibody, three cells that lack the corresponding antigen must have a negative reaction and three cells that possess the corresponding antigen must have a positive reaction.
- If more than one or two antibodies are present, additional testing using selected cells will usually need to be performed = several hours to days!!!
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### Patient Cells

0
Type and Cross

• Perform ABO type
• Perform antibody screen and antibody identification if screen is positive
• Perform crossmatch of red blood cells
Types of Crossmatch

• **Electronic Crossmatch**
  – The patients’ ABO and Rh type are determined on two different samples
  – Computer checks to ensure that the unit being issued is compatible with the patient
  – This is not a liquid crossmatch
  – 5 – 10 minutes

• **Immediate Spin Crossmatch**
  – Patient’s serum is incubated with a few drops of RBCs from the unit then is immediately spun down
  – Clumping = incompatibility
  – No clumping = compatibility
  – Only detects ABO incompatibility
  – 15 – 20 minutes
Types of Crossmatch

• **Antiglobulin Crossmatch**
  – Patient’s serum is incubated with a few drops of RBCs from unit, then washed, then anti-human globulin is added
  – Clumping or hemolysis if incompatible
  – Detects ABO, Rh and other blood group incompatibility
  – Must use this crossmatch if the patient has antibodies other than ABO
  – At least an hour
Type and Screen/Type and Cross?

You need to order a type and cross if:

- Your patient is likely to need blood
  - Placenta accreta
  - Placenta increta
  - Placenta percreta
- Your patient has red blood cell antibodies
- If uncertain, talk to the transfusion service Medical Director
Transfusion in Emergency Situations

- Massive Transfusion Protocols
- Emergency Release of Blood Products
- Plasma
Massive Transfusion Protocols

• **Every** hospital should have a massive transfusion protocol (MTP)

• Massive transfusion is generally defined as 10 units of red blood cells in less than 24 hours

• Hospitals that use the MTP infrequently should perform a test (a fire drill) of the protocol on a regular basis

• After the drill, everyone involved in testing the MTP should discuss what worked and what didn’t work to improve the process
## UC, San Diego Health System MTP

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UC, San Diego Health System MTP

- Activated by a phone call to the transfusion service
- Must state patient name, location, MRN and “activating massive transfusion protocol”
- Must bring completed pick up slip to blood bank to pick up the blood
- After release of each round of blood products the transfusion service automatically prepares the next round of products
- Remember to call the transfusion service to deactivate the MTP
Emergency Release of Blood Products

• Your hospital should always be able to perform emergency release of blood products

• Red blood cells
  – Emergency release of group O, Rh-negative red blood cells can be completed in 5 minutes

• Platelets
  – Emergency release of platelets can be completed in 5 minutes if your hospital keeps platelets in the transfusion service at all times
  – If your hospital does not keep platelets available at all times, it can take hours to have a platelet shipped from the blood center.

• Plasma
  – Emergency release of group AB plasma can be completed in 5 minutes if your hospital keeps thawed AB plasma available at all times
  – Emergency release of plasma can take up to an hour if your hospital does not keep thawed plasma available at all times
When Should I Order Plasma to be Thawed Before Delivery

- If your patient is likely to use 6 or more units of packed red blood cells during surgery, you should order plasma to be thawed prior to surgery
- If you have transfused 10 units of red blood cells, you should also have transfused plasma
Questions

• What is the name of my Transfusion Service Medical Director?
• How many units of group O, Rh-negative red blood cells does my hospital keep on the shelf? Is that enough?
• Does my hospital keep thawed plasma available at all times? If yes, how many units and what blood type?
• Does my hospital use 5 day thawed plasma? If not, why?
• Does my hospital purchase pre-pooled cryoprecipitate? If not, why?
• Does my hospital keep platelets in the transfusion service at all times? If yes, how many units? If not, why?
• Does my hospital have a MTP?
• When was the last time my hospital’s MTP was tested?
Questions?
pkopko@ucsd.edu