V2: ANESTHESIOLOGY BLOOD BANK ROTATION: COMPACT SCHEDULE

All 12 residents attend 12-1pm sessions (labeled "ALL 12 residents" on the schedule) Mon-Thu.
Also, each small group travels together for 5 days: 10am-12pm Mon-Fri & 1-3pm Mon-Thu.

SMALL GROUP 1	SMALL GROUP 2	SMALL GROUP 3
Resident 1	Resident 5	Resident 9
Resident 2	Resident 6	Resident 10
Resident 3	Resident 7	Resident 11
Resident 4	Resident 8	Resident 12

LOCATION:
Blood bank
unless (room #)

	MON	TUE	WED	THU	FRI
	13-Nov	14-Nov	15-Nov	16-Nov	17-Nov
10am	**TOUR &**	**ANTIBODY SCREEN**	**ANTIBODY ID 1**	**REACTION**	Conversations 2
11am	**ISSUE PRODUCTS**	SIGNOUT @ 11		**WORKUP**	SIGNOUT @ 11
12pm	ALL 12 residents (MFCB 3156)	ALL 12 residents (MFCB 3156)	ALL 12 residents (MFCB **2114**)	ALL 12 residents (MFCB **4114**)	
1pm	**ABO/D**	RED CROSS @ 1:30	**CROSSMATCH**	Conversations 1	
2pm	**TYPING**	(4860 Sheboygan Ave)			

20-Nov	21-Nov	22-Nov	23-Nov	24-Nov
nothing planned Monday 11/20 through Friday 11/24				

	27-Nov	28-Nov	29-Nov	30-Nov	1-Dec
10am	**TOUR &**	**ANTIBODY SCREEN**	**ANTIBODY ID 1**	**REACTION**	Conversations 2
11am	**ISSUE PRODUCTS**	SIGNOUT @ 11		**WORKUP**	SIGNOUT @ 11
12pm	ALL 12 residents (MFCB 3156)	ALL 12 residents (MFCB 3156)	ALL 12 residents (MFCB 3156)	ALL 12 residents (MFCB 3156)	
1pm	**ABO/D**	RED CROSS @ 1:30	**CROSSMATCH**	Conversations 1	
2pm	**TYPING**	(4860 Sheboygan Ave)			

	4-Dec	5-Dec	6-Dec	7-Dec	8-Dec
10am	**TOUR &**	**ANTIBODY SCREEN**	**ANTIBODY ID 1**	**REACTION**	Conversations 2
11am	**ISSUE PRODUCTS**	SIGNOUT @ 11		**WORKUP**	SIGNOUT @ 11
12pm	ALL 12 residents (MFCB 3156)	ALL 12 residents (MFCB 3156)	ALL 12 residents (MFCB 3156)	ALL 12 residents (MFCB **3114**)	
1pm	**ABO/D**	RED CROSS @ 1:30	**CROSSMATCH**	Conversations 1	
2pm	**TYPING**	(4860 Sheboygan Ave)			

Tour & Issue Products: What's where in the blood bank. Issue RBCs, plasma, platelets.
ABO/D Typing: Determine blood type of patient.
Antibody Screen: Look for non-ABO red cell antibodies in patient plasma.
Signout: Pathology resident & attending write & review antibody, reaction, & SOP deviation reports.
Red Cross: Intro to donor screening & testing and product processing.
Antibody ID: Determine specificity of non-ABO red cell antibody after a positive screen.
Crossmatch: Determine if a specific RBC unit is compatible with patient plasma.
Reaction Workup: Clerical check, DAT, visual hemolysis check, & contact pathology resident.
Conversations: Prepare for common conversations with blood bank physicians.

Anesthesiology Blood Bank Rotation

Welcome to the blood bank rotation! The two main parts are:

1. **Noon sessions with all 12 residents (SEE PAGES 2-6)**
   a. Mon-Thu 12pm-1pm (no noon sessions on Fridays) x3 weeks = 12 total sessions
   b. Resident-centric group discussions of study questions; no lectures
   c. Faculty provides oversight but is not the primary source of answers
2. **Small group activities as a group of 4 (SEE PAGES 7-8)**
   a. Your small group of 4 spends 5 days together
   b. 10am-12pm & 1pm-3pm each day (except no PM on Friday)
   c. Concrete hands-on experience via lab exercises

Learning objectives are listed in context below. The main learning objective is to learn the basic principles of:
- blood products (composition, preparation, indications, donation)
- pretransfusion compatibility testing
- transfusion reactions

This rotation should be seen as introductory rather than comprehensive.

References
1. All chapter references are from the ebook: ***Transfusion Medicine & Hemostasis, 1st edition***
2. Choosing Wisely guidelines
http://www.choosingwisely.org/wp-content/uploads/2015/02/AABB-Choosing-Wisely-List.pdf
3. ASA Guidelines
http://www.asahq.org/~/media/sites/asahq/files/public/resources/standards-guidelines/practice-guidelines-for-perioperative-blood-management.pdf
4. Other resources on specific topics are listed in context below

Noon Sessions with All 12 Residents

Location: See each day below (or page one's compact schedule) for room number

Noon sessions are group discussion format. Prepare in advance by answering all the questions for that day's session. Feel free to use the computer or marker board to explain concepts and points to your peers. A computer and projector/screen will be in the room. You are free to bring lunch, laptop, etc.

To minimize wasted time, we should do our best to adhere to two norms:
1. Start on time.
2. Do not engage in potentially distracting activities (e.g. texting, extracurricular internet/conversations).

Each of the 12 residents will lead the discussion once. The leader's main duties are:
1) start on time and end on time or early
2) prepare the computer & projector/screen (e.g. open the question document on the computer)
3) create a constructive, collaborative, and positive learning environment
4) **make sure each resident answers at least one question per session**
5) keep the group on track and engaged
6) end the session with a checkout (i.e. "What went well? What can we do better next time?").

See each day below for discussion leader assignments in bold. If you need to trade dates, then mutually-agreed trades can be made between residents as long as each resident leads one session.

Monday 11/13/2017

Chapter 78: Overview of the Coagulation System

1. Motivating Question: What do you want to get out of this blood bank rotation?
2. What are the initial physiologic responses to bleeding?
3. What is primary hemostasis?
4. What is secondary hemostasis?
5. How does primary hemostasis begin?
6. How do platelets adhere?
7. How do platelets aggregate?
8. How does the coagulation cascade begin in vivo?
9. Where does tissue factor come from?
10. How is factor 7 activated?
11. What are two ways the TF-7a complex can lead to thrombin formation?
12. What is the main hemostatic function of thrombin?
13. What is the main regulation of coagulation (i.e. anticoagulant) function of thrombin?
14. What are the main sources of phospholipid? That is, where does fibrin formation physically occur?

Tuesday 11/14/2017

Chapter 28: Red Blood Cells, Chapters 36-38: Irradiation, Leukoreduction, & CMV-Safe Products

1. Motivating Question: Have you heard about a "target hemoglobin or hematocrit"? What do you recall?
2. Based on Table 28.2 & the text below it, what are the general indications for RBCs?
3. Based on Table 28.2 & p157, what are the general contraindications for RBCs?
4. What is more clinically useful than a hemoglobin/hematocrit "trigger"?
5. Why not just use a strict hemoglobin/hematocrit "trigger" for all transfusion decisions?
6. While there is a lot to say about the decision to transfuse in particular patient populations, why might it matter if you use a restrictive or liberal RBC transfusion strategy?
7. All other factors being equal, why might a more liberally transfused patient do worse than a restrictively transfused patient?
8. As a dosing guide in adults, how much does one unit of RBCs raise the hemoglobin? Hematocrit?
9. For kids, what is the usual weight-based dosing calculation?
10. What is the main purpose of irradiating blood?
11. What are some common indications for irradiated cellular blood products? What do they have in common?
12. What are some patient populations that, perhaps surprisingly, do not benefit from irradiated blood?
13. What are the three main benefits of leukoreduction?
14. What is the best way to minimize the risk of CMV-transmission from blood products?

Wednesday 11/15/2017

Chapter 29: Plasma & Chapter 31: Cryoprecipitate

1. Motivating Question: Have you heard about a "target INR"? What do you recall?
2. What is the composition of plasma?
3. How long does it take to thaw plasma? At what temperature?
4. Based on Table 29.1, what are the general indications for plasma?
5. Based on Table 29.1, what are the general contraindications for plasma?
6. Among patients who are not bleeding and not at risk of bleeding, who should receive plasma?
7. Is plasma generally indicated to correct the INR before minor surgical procedures?
8. In patients on warfarin with active bleeding or requiring urgent surgery, what should be done?
9. Based on Table 29.2, what are the general principles for non-urgent warfarin reversal?
10. What weight-based dosing is usually used for plasma? What is the typical factor activity increment?
11. What is the usual volume of one unit of plasma?
12. How many units of plasma are given in common practice? What change in INR is typical?
13. How is cryoprecipitate made?
14. What is the composition of cryo? How does it differ from plasma?
15. Based on Table 31.1 & the paragraph above it, what are the primary indications for cryo?
16. Based on Table 31.1 & the paragraph above it, what are the common misuses of cryo?

Thursday 11/16/2017

Chapter 30: Platelets

1. Motivating Question: Have you heard about a "target platelet count"? What do you recall?
2. What are the differences between: an apheresis platelet, a random donor platelet, & a pooled platelet?
3. What are the general guidelines for *prophylactic* platelet transfusions?
4. What are the general guidelines for *therapeutic* platelet transfusions?
5. What are relative contraindications for platelets?
6. At what temperature are platelets stored?
7. What is the shelf life of platelets?
8. How is storage bag material for platelets different from that used for RBCs, plasma, & cryo?
9. When do bacteria in platelets enter the exponential growth phase?
10. How much does one apheresis platelet typically raise the platelet count?
11. How can response to platelet transfusion be assessed?
12. Must platelets be ABO compatible? Why or why not?

Monday 11/27/2017

Chapter 50: Massive Transfusion

1. Motivating Question: What have you experienced or heard about MTPs (massive transfusion protocols)?
2. What are some definitions of a massive transfusion?
3. When blood loss is excessive and time does not permit timely completion of ABO typing before issuing units, what ABO type of RBCs should be issued initially?
4. What ABO type of plasma?
5. What percentage of the population is type AB?
6. What are two advantages of sending a patient sample for ABO typing as soon as possible?
7. What is meant by a "component based therapy" approach?
8. What are three disadvantages of such an approach compared to an MTP? Hints: labs, clerical, ratios.
9. What is encompassed by the term MTP?
10. What causes massive transfusion-related hypothermia?
11. What causes massive transfusion-related acidosis?
12. What are the consequences of massive transfusion-related hypothermia & acidosis?
13. What is the main principle behind the ratios of blood products in current MTPs?
14. Using uconnect: What is the difference between emergency release blood and the MTP?
15. Using uconnect: If you want 2 units of RBCs ASAP for a patient with no/incomplete pre-transfusion testing, is it faster to obtain 2 units by ordering 2 units of emergency release RBCs or by activating the MTP?
16. Using uconnect: What is the composition and sequence of products in UW's current MTP?
17. After activating the MTP, what blood product orders are required?

Tuesday 11/28/2017

Chapter 51: Perioperative Blood Management

1. Motivating Question: What experiences have you had with any of the following: reversing anticoagulants, reversing antiplatelets, correcting preoperative anemia, anti-hemorrhagic drugs, and cell saver?
2. What is blood management? What are the four main tenets of blood management?
3. What is the strongest predictor of a patient requiring blood during an elective surgery?
4. How is heparin reversed?
5. Why would plasma transfusion be a bad way to reverse heparin?
6. How is warfarin reversed?
7. How is a direct thrombin inhibitor reversed?
8. What are two possible treatments for preoperative anemia?
9. What are the indications for erythropoietin?
10. How long does erythropoietin usually take to stimulate adequate RBC production?
11. What is the mechanism of DDAVP in promoting hemostasis?
12. What are the indications for DDAVP in promoting hemostasis?
13. What is the mechanism of aminocaproic acid (Amicar)?
14. What is intraoperative autologous transfusion?
15. What are two general contraindications to intraoperative autologous transfusion?

Wednesday 11/29/2017
Chapter 53: Febrile Transfusion Reactions
Chapter 54: Allergic & Anaphylactic Transfusion Reactions

1. Motivating Question: What experiences have you had with patients who had a transfusion reaction (or a suspected transfusion reaction)?
2. What is a febrile non-hemolytic transfusion reaction (FNHTR)?
3. Fever can accompany which three types of serious transfusion reactions?
4. What are two potential mechanisms of FNHTRs?
5. What is the management of a FNHTR?
6. What is the pathophysiology of an allergic transfusion reaction?
7. What are the typical signs and symptoms of a mild allergic transfusion reaction?
8. What is the management of a mild allergic transfusion reaction?
9. What are the signs and symptoms of an anaphylactic transfusion reaction?
10. What is the most common cause of an anaphylactic transfusion reaction in the US?
11. What is the immediate management of an anaphylactic transfusion reaction?
12. What products are given to a patient who had an anaphylactic transfusion reaction due to IgA deficiency?

Thursday 11/30/2017
Chapter 55: Acute Hemolytic Transfusion Reactions
Chapter 56: Delayed Hemolytic Transfusion Reactions

1. Motivating Question: What stories or advice have you heard from colleagues about transfusion reactions (or suspected transfusion reactions)?
2. What is the most common immune cause of an acute hemolytic transfusion reaction (AHTR)?
3. What is the pathophysiology of an AHTR? What causes RBC destruction?
4. What are the main products of brisk hemolysis? Why are these harmful?
5. What are the signs and symptoms of an AHTR?
6. What are some other causes of a brisk hemolysis that can look like an AHTR?
7. What is the management of an AHTR?
8. What is the most common error leading to ABO-incompatible transfusions?
9. What is the second most common?
10. How can AHTRs be prevented?
11. What is a delayed hemolytic transfusion reaction (DHTR)?
12. What is a delayed serologic transfusion reaction (DSTR)?
13. What is the pathophysiology of a DHTR?
14. What are the typical clinical & laboratory findings in a DHTR?
15. What is the management of a DHTR?

Monday 12/4/2017 & Tuesday 12/5/2017 Hands-On OR Sessions Led by Senior Resident

Wednesday 12/6/2017
Chapter 57: TACO
Chapter 58: TRALI

1. Motivating Question: What experiences have you had with patients with suspected TRALI? What have you heard colleagues talk about or seen them write in notes about TRALI as a possible diagnosis?
2. What is TACO?
3. What is the pathophysiology of TACO?
4. What are the clinical manifestations of TACO?
5. How is TACO diagnosed?
6. What is the management of TACO?
7. What is TRALI?
8. What is the pathophysiology of TRALI?
9. What are the clinical manifestations of TRALI?
10. How is TRALI diagnosed?
11. What antibody findings are useful in the *diagnosis* of TRALI?
12. What is the management of TRALI?
13. When do most patients with TRALI improve?

14. What are some strategies for preventing TRALI?
15. What do TACO and TRALI have in common?
16. How can TACO and TRALI be distinguished?

Thursday 12/7/2017
Chapter 59: Septic Transfusion Reactions
Chapter 60: Metabolic Complications
1. Motivating Question: What experiences have you had with patients with sepsis of any etiology?
2. What are the clinical manifestations of septic transfusion reactions?
3. How is a septic transfusion reaction diagnosed?
4. How can you distinguish a FNHTR from a septic transfusion reaction?
5. What is the management of a septic transfusion reaction?
6. What is the most common bug in RBC-associated sepsis?
7. What is the most common type of bug in platelet-associated sepsis?
8. How is bacterial contamination prevented?
9. What causes hypothermia from transfusions? What are the 5 most important effects?
10. What causes hypocalcemia from transfusions?
11. What populations are more at risk of hypocalcemia from transfusions?
12. What are some possible clinical manifestations of hypocalcemia?
13. Checkout: For next year's BB rotation, what should be increased/added? Decreased/eliminated? Done differently? Done the same?

Small Group Activities as a Group of 4

Location: All activities are in the Blood Bank or BB conference room except for:
- Red Cross visit on Day 2 Afternoon (4860 Sheboygan Ave)

Day 1 Morning Tour & Issuing Products
Chapter 9: Component Preparation and Manufacturing p45-50
Motivating Question: How would you explain to a patient in layman's terms how each blood product is made?

Day 1 Afternoon ABO/D Typing
Chapter 19: Pretransfusion Testing p93-100 (stop before “Causes of Unexpected Test Results”)
Understand and be able to apply Tables 19.1-4
Motivating Question: How would you explain ABO typing to a medical student? What ABO compatible means?

Day 2 Morning Antibody Screen (and Report Signout at 11am in BB conference room)
Chapter 20: Antibody Identification p103-106 (stop before “RBC Phenotype”)
Motivating Question: How would you explain an antibody screen to a med student? How the results are used?

Day 2 Afternoon Red Cross visit (arrive 1:30 at main entrance desk)
Chapter 6: Apheresis Blood Component Collections p33-35
Chapter 11: Overview of Infectious Disease Testing p55-57
Motivating Question: How would you explain blood donation & donor screening to patient in layman's terms?

Day 3 Morning Antibody Identification 1
http://www.austincc.edu/mlt/bb/AbIdentificationReneeWilkins.ppt (slides 1-44)
Motivating Question: How would you explain to a medical student how the antibody specificity is determined?

Day 3 Afternoon Crossmatch
Chapter 20: Antibody Identification p109 “Blood Component Selection” & p110 “Crossmatch”
Motivating Question: How would you explain a crossmatch to a medical student? What is the purpose?

Day 4 Morning Reaction Workup
Chapter 21: Direct Antiglobulin Test p111-114
Motivating Question: How would you explain to a medical student how a DAT is done? How is it interpreted?

Day 4 Afternoon Common Conversations with Blood Bankers 1 (BB conference room)
Application: Emergency Release Blood
https://www.pathology.med.umich.edu/bloodbank/manual/bbch_3/index.html
1. What is the range of possibilities that is included in the term "emergency release"?
2. When is emergency release blood indicated?
3. What are the pros and cons of emergency release blood?
4. Does receiving emergency release blood remove the need to get a sample for pre-transfusion testing? Why or why not?

Application: Crossmatch Incompatibility due to Warm Autoantibody
Chapter 44: Autoimmune Hemolytic Anemia
1. What is the target of the typical warm autoantibody?
2. Does the presence of a warm autoantibody mean that the patient is hemolyzing?
3. What is the difference between "crossmatch incompatible due to a warm auto" and "ABO incompatible"?
4. How does a warm autoantibody make it time-consuming to identify alloantibodies?
5. What do you consider when deciding whether or not to transfuse a patient with a warm autoantibody?

Day 5 Morning Common Conversations with Blood Bankers 2 (& Report Signout 11am) BB conference room
Application: Platelet Futility
Chapter 49: Platelet Refractoriness
1. What is the definition of platelet refractoriness?
2. What are some common causes of non-immune refractoriness?
3. What are some common causes of immune refractoriness?
4. Based on the TRAP trial definition, how is the CCI calculated?
5. What is a CCI that is suspicious for immune refractoriness?
6. What is the shelf-life of platelets? How does this affect our ability to stockpile platelets & prevent shortages?
7. What is the basic difference between HLA antigen based selection and platelet crossmatching?

http://onlinelibrary.wiley.com/doi/10.1111/j.1537-2995.2007.01126.x/full
8. In the article section "Management of Hemostasis in Refractory Patients," what are some interventions that appear to be ineffective?
9. What are some interventions that appear to be effective?

Bonus reading
http://www.sciencedirect.com/science/article/pii/S0953620516304034
Bonus question: A clinical team insists on a specific platelet target before they will perform a procedure. You transfuse 4 units of platelets over a few hours, but the patient's platelet count doesn't increase after each of the transfusions. The procedure team's resident insists that you transfuse more platelets. After ordering platelets number 5 and 6, the blood bank resident calls you to offer assistance in formulating a plan. What would you do? What are some options? What factors do you consider?