Fein’s hematology missions

- Eliminate HIT
- Minimize use of IVC filters
- Minimize blood transfusions
- Evaluate risk/benefit of anticoagulation
- Save and cure patients with APL
- Cure patients with leukemia or lymphoma

Hematology consult for anemia

- 30yo AA woman G2P1
- 32 wks gestation, PTL
- c/o fatigue
- PMH: C section
- FHx “sickle cell”
- Exam: comfortable, no resp distress, not tachy
Hematology consult for anemia

- Unsuspecting patient got RBC against the advice of the hematologist
- Doubt she had a chance to discuss risk/benefit profile with a physician
- Most beneficial part of RBC was iron, already receiving but takes time to help
- Poor Obstetrician was called at 5am

What I’m going to discuss

- Benefits and risks of blood transfusion
- BHSF Blood Conservation Program
- Decreasing transfusions
- Decreasing phlebotomy
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Transfusions in 2012

Bleeding after trauma or surgery
Acute GI bleed
Post-partum bleeding

Transfusions in 2012

Cancer patients receiving cytotoxic chemotherapy
MDS patients receiving palliative treatment
Thalassemia major patients
Sickle cell disease with life-threatening complication or refractory pain crisis

What if you need a transfusion?

• Would you accept a transfusion without investigating the risks and benefits?

• What questions do you have about blood?
  – Reactions?
  – Infection?
  – Will it make me heal faster or slower?
**What does a transfusion do for pt?**

<table>
<thead>
<tr>
<th>Component</th>
<th>Effect</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>RBC</td>
<td>Increase Hgb by 1</td>
<td>May last 1-2 weeks</td>
</tr>
<tr>
<td>Pooled plts</td>
<td>Increase plts by 30</td>
<td>May last 2-3 days</td>
</tr>
<tr>
<td>Pheresis plts</td>
<td>Increase plts by 30</td>
<td>May last 2-3 days</td>
</tr>
<tr>
<td>Plasma (FFP)</td>
<td>Decrease PT INR?</td>
<td></td>
</tr>
<tr>
<td>Cryoprecipitate</td>
<td>Increase fibrinogen</td>
<td></td>
</tr>
</tbody>
</table>

**Benefits of transfusion**

<table>
<thead>
<tr>
<th>Component</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>RBC</td>
<td>Iron repletion for iron deficiency</td>
</tr>
<tr>
<td></td>
<td>Replace lost blood in bleeding pt</td>
</tr>
<tr>
<td></td>
<td>Supply oxygen-carrying capacity</td>
</tr>
<tr>
<td></td>
<td>Treat “symptomatic” anemia in patients with RBC production prob (or sometimes hemolytic anemia)</td>
</tr>
<tr>
<td>Platelets</td>
<td>Stop or prevent bleeding</td>
</tr>
<tr>
<td>Plasma</td>
<td>Stop or prevent bleeding</td>
</tr>
<tr>
<td></td>
<td>Special circumstances: TTP</td>
</tr>
</tbody>
</table>

**Patients who need platelets**

- Chemotherapy pts with bleeding or <10k
- Non-chemo pts with bleeding or <10k
- Platelet dysfunction disorders or meds
- Thrombocytopenia with major procedure
  - 1 dose (formerly known as 6 units)
  - Goal 50k for surgery or 80k for CNS surgery
  - Usually not worth wasting time “retesting”

**Patients who need plasma**

- Coagulopathy with bleeding or DIC
  - 2 units FFP q6h
- Coagulopathy with invasive procedure
  - 15ml/kg = 3-4 units FFP within 4 hours
- Cryoprecipitate if fibrinogen <150 and DIC
Types of Transfusion Reactions

**Acute Reactions** (Minutes to Hours)
- Anaphylaxis
- Other allergic reactions
- ABO incompatibility
- Bacterial contamination
- Febrile non-hemolytic transfusion reaction
- Transfusion-Related Acute Lung Injury (TRALI)

**Delayed Reactions** (Days to Weeks)
- Extravascular hemolysis
- Post-transfusion purpura
- Graft vs. host reaction
- Transmission of infectious agents
- Unrecognized risks

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**Acute transfusion reactions**
1. Immediate hypotension (IgA defic)
2. Immediate rash (Ab vs. transfused proteins)
3. Immediate fever and flank pain (ABO)
4. Fever and hypotension (bacteria)
5. Fever and chills (rejection, cytokines)
6. Dyspnea, hypoxia, and tachycardia several hours later (TRALI)

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**ABO incompatibility**
- Symptoms/signs:
  - Fever, flank pain, dark urine ARF, hypotension
  - 1 in 75,000 RBC (250 per yr) transfusions, 10% fatal
  - Starts within minutes of transfusion
  - Caused by systems error
  - Treatments:
    - Stop RBC, hydration

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**Transfusion-Related Acute Lung Injury (TRALI)**
- 1-5% of FFP or plt transfusions
- 4-6h after transfusion
- Capillary leak syndrome
- Donor anti-HLA antibody
- Resembles CHF:
  - Dyspnea, tachycardia
  - Frothy sputum
  - Hypoxia out of proportion to exam
- Treatment: support
TRALI is the tip of the iceberg

![TRALI Pyramid Diagram]

What is the risk of acquiring HIV from a transfusion in 2012?

- 1 in 500,000
- 1 in a million
- 0
- No way to know for sure

Transmission of HIV

- Case 14 AIDS cases reported
- HIV diagnosis method of high-risk blood transfusion
- Antiviral screening implemented
- Anti HIV screening implemented
- New version of HIV testing implemented
- New version of HIV testing implemented

Now about 5-10 per year out of 18 million
Acquired infections

- HIV 1 in 2,000,000
- HBV 1 in 60-100,000
- HCV 1 in 100-200,000
- Parvovirus 1 in 40,000
- CMV
- Other infections: Lyme, malaria, West Nile virus, syphilis, Chagas, Jakob-Creutzfeldt
- Undiscovered infections

Put the risk into perspective

Risks of Dying:
- Cancer 1 in 4
- CABG 1 in 33
- Car accident 1 in 200,000
- Blood transfusion AIDS 1 in 2,000,000
- Airplane accident 1 in 7,000,000

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Blood Conservation Program (BCP)
**Blood conservation program**

- Collaborative effort
- Consent
- Identify bleeders
- Pre-procedure iron repletion
- Peri-procedure procoagulants
- Minimize phlebotomy

**Collaboration**

- Hematology pre-op evaluation and mgmt
- Anesthesia fluid management
- Surgeon technique
- Nursing support

**Consent**

- Blood product refusal may be risky
- Procoagulant medications may be beneficial, but they also carry risks
- Patients understand the risks of refusing blood products, and they consent to alternative treatments
**Identify bleeders**

- History and physical exam
- h/o bleeding or bruising
- Identify coagulopathy, anti-platelet meds
- Identify patients with iron deficiency (indicated chronic bleeding)

**Procoagulants**

- If bleeding occurs, infuse
  - Aminocaproic acid
  - ddAVP
  - Cryoprecipitate
  - Recombinant Factor VIIa
  - High dose estrogen

**Minimize phlebotomy**

**How I deal with BCP patients**

- Convince everybody anemia doesn’t kill
- Try to determine bleeding risk
- Try to determine active bleeding without doing too much phlebotomy
- Use procoagulants to stop bleeding
- Use intravenous iron early
- (Epo less important)
How I deal with BCP patients

• Infuse intravenous iron
• Stop bleeding
• Allow patients to recover from anemia
  – Hematopoiesis takes 1-2 weeks
• Choose procedures wisely
• Address psychosocial issues

How I deal with BCP patients

• DVT prevention
  – Should be same standard as other patients
  – Do not be afraid to use anticoagulants
  – Better to prevent DVT than to treat it
  – Injections better than warfarin if possible

How I deal with BCP patients

• Psychosocial issues
  – Patients fear dying
  – Providers fear liability
  – Providers unwilling to participate
  – Treatments that are nonstandard
  – Patients being pressured to take blood
  – Family dynamics
  – End-of-life discussions

Extending blood conservation

• All may benefit from reducing transfusions
• All may benefit from reducing phlebotomy
• Blood supply is limited
  Save it for those who need it most!
What I’m going to discuss

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Using transfusions wisely

Must determine whether the benefit is worth the risk

Give RBC for perfusion, not for O2-carrying capacity

Need for RBC transfusion depends on rate of blood loss and comorbidities

Using transfusions wisely

• RBC only last a few weeks
• Platelets only last a few days
• Plasma only lasts a few hours

• Need to treat the underlying problem

Why we transfuse so much

• False belief: Fix numbers=fix patient
• Makes patient feel better
• Pressure from nurse calling critical values
• So easy to order, reactions seem rare
• Makes it seem like we’re doing something for the patients—some even want it
When do benefits outweigh risks?

Usually appropriate
• Bleeding due to trauma or surgery
• Acute GI bleed
• Post-partum hemorrhage

Sometimes appropriate
• Thalassemia major
• Sickle Cell Disease with complications
• MDS, Aplastic Anemia
• Chemotherapy-associated anemia

Transfusing sickle cell patients

Discontinuing Prophylactic Transfusions Used to Prevent Stroke in Sickle Cell Disease

The Optimizing Primary Stroke Prevention in Sickle Cell Anemia (STOP2) Trial Investigators

• Transfusions may help prevent stroke in children with sickle cell disease

Transfusing MDS patients

• MDS affects bone marrow function
• Some patients are transfusion dependent
• Goal of anti-MDS therapy is to decrease frequency of RBC transfusions
• Frequent, persistent transfusion usually signifies advanced disease, short life

Minimize transfusions in critically ill patients

A MULTICENTER, RANDOMIZED, CONTROLLED CLINICAL TRIAL OF TRANSFUSION REQUIREMENTS IN CRITICAL CARE

The New England Journal of Medicine PEER REV 13, 1999

[Graph showing survival rates with and without transfusions]
**Why transfusions might not help**

- Stored RBC lose 2,3-DPG so can’t release oxygen into tissues effectively
- RBC become less deformable, maybe increased viscosity affects microcirculation
- Recognized or unrecognized transfusions reactions may affect healing

**Reasons not to transfuse RBC**

- Transfusions are toxic
- Risk is unpredictable
- Transfusions are expensive
- Transfused blood is transient
- Transfused blood might not work well
- Blood products are scarce

**Ways to decrease transfusions**

- Every transfusion needs a reason
  - i.e. “Bleeding” or “refractory sickle cell crisis”
- Try not to transfuse for numbers
  - Transfuse bleeding patients
- Use transfusions parameters whenever you request serial labs
  - Better communication
  - Fewer alert phone calls and RBC phone orders
- Address cause of anemia/bleeding

**Avoid transfusing patients with iron deficiency or chronic bleed**

- Chronic bleeding causes iron deficiency
- Anemia caused by bleeding and lack of Fe
- Transfusion mainly repletes iron
- Can substitute IV iron formulations
- Need to identify cause of bleeding
**Intravenous iron better than oral**

The Treatment of Iron Deficiency Anemia

**Change of fatigue in patients with baseline ferritin ≤ 15 ng/mL depending on the administration of iron vs. placebo (P = .005)**

- Young adult women c/o fatigue
- Hemoglobin>12
- N=40 ferr<50, 45 ferr<15
- Iron sucrose vs. placebo (200mgx4)

**Transfusion parameters**

- Any time you order serial CBC’s you should write transfusion parameters

- “Whenever HCT<22 transfuse 1 unit RBC”

Premeds:
- Tylenol 650mg po and benadryl 12.5mg IV
How I select a transfusion trigger

- There is no “universal” transfusion trigger
- In bleeding patients, assess rate of blood loss and try to replace at same rate
  - E.g. every HCT drop 2-3 points=1 unit RBC
- In nonbleeding patients, decide what number is uncomfortable or unsafe for pt

Platelet transfusion trigger

- Any time you order serial CBC’s you should write transfusion parameters
- “Whenever plt<10 transfuse 1 dose plt”
- Premeds:
  - Tylenol 650mg po and benadryl 12.5mg IV
  - Use 20 or 30 for critically ill or DIC
  - Use 50 for bleeding patients

What I’m going to discuss

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Why blood is drawn from inpatients

- Initial diagnostic testing
- Follow-up diagnostic testing
- Serial testing of a known or expected abnormal lab test result
  - To act on changing lab results (e.g., HCT)
  - To observe changing lab results (e.g., CK)
Why we order so many labs

• We like data
• We were raised on labs
• So easy to order
• Seems cheap (per lab test)
• We’re not the ones getting stuck
• We’re not even the ones doing the sticking
• Makes it seem like we’re doing something for the patients—some even want it

Question your lab test requests

• When you request a lab test do you plan your intervention for abnormal test results?
• When you request serial labs how do you determine the interval?
• Think about how much iron and blood is wasted by excessive phlebotomy
• Think about how much expense is wasted

How to decrease phlebotomy

• Follow-up diagnostic testing should occur only at an interval during which you might expect a change
  – f/u CBC’s for hemodilution or bleeding
  – f/u chemistries only if expected to change
• Serial testing only needed for active issues
  – Usually don’t need q6h or q8h tests
  – Usually don’t need a “post-transfusion” CBC
  – Rarely need serial coag testing

How to decrease phlebotomy

• Try to lump testing together—all AM labs
  – Patients and nurses appreciate it
  – You rarely need afternoon lab data
• Think about skipping a day of AM labs in patients who have been “stable”
• Each test you request should have a purpose and a possible intervention
• Check prior labs and pending lab orders before requesting atypical tests
What we have discussed

• Transfusions are an important component of inpatient medicine and critical care
• Transfusions may be appropriate for bleeding or to prevent bleeding
• To justify transfusing, the benefits must outweigh the possible risks
• Iron deficiency is an important problem
• Blood conservation may benefit all patients