PATIENT BLOOD MANAGEMENT

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University of Arkansas for Medical Sciences
I have no relevant relationships to disclose.
Learning Objectives

1. Introduce patient blood management and its goals

2. Establish baseline knowledge of transfusion guidelines

3. Demonstrate that improved blood management can be accomplished within the laboratory
Patient Blood Management

An Introduction or

“The What”
What is Patient Blood Management?

- Patient centered
- Anemia management
- Conservation of blood
- Coagulation
Patient Centered

- Listen to patient needs, beliefs and desires
- Provide patient with current information on all treatment options
- Fully inform of risks, benefits and alternatives
- Communicate and document
Patient Centered

- Jehovah's Witness patients
  - Well informed
  - Carry advance directive card
  - In general do not accept blood, fractions, or autologous
  - May accept cell salvage, acute normovolemic hemodilution and other therapies
What is Patient Blood Management?

- Patient centered
- Anemia management
- Conservation of blood
- Coagulation
Anemia Management

- Determine cause
- Evidence based intervention
- Decrease oxygen consumption
- Use red blood cell transfusion if evidence based
Anemia Management

- Preoperative anemia very common
  - Most important predictor of perioperative transfusion

- Detection of cause important
  - Iron deficiency
  - Nutritional deficiency
  - Occult blood loss
Anemia Management

- Intervention
  - Iron replacement
  - Nutritional support
  - Detection of source of blood loss
  - Medication
Anemia Management

- Decrease oxygen consumption
  - Bedrest
  - Oxygen supplementation
Anemia Management

- Use red blood cell transfusion when evidence based
  - Society of Critical Care Medicine
  - American Society of Anesthesiologists
  - American Society of Hospital Medicine
  - American Society of Hematology
  - AABB
Clinical Practice Guidelines From the AABB
Red Blood Cell Transfusion Thresholds and Storage

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October 12, 2016

Clinical Review & Education

Clinical Practice Guidelines From the AABB
Red Blood Cell Transfusion Thresholds and Storage

Importance

More than 100 million units of blood are collected worldwide each year, yet the indication for red blood cell (RBC) transfusion and the optimal length of RBC storage prior to transfusion are uncertain.

Objective

To provide recommendations for the target hemoglobin level for RBC transfusion among hospitalized adult patients who are hemodynamically stable and the length of time RBCs should be stored prior to transfusion.

Evidence Review

Reference librarians conducted a literature search for randomized clinical trials (RCTs) evaluating hemoglobin thresholds for RBC transfusion (1950-May 2016) and RBC storage duration (1948-May 2016), with data being limited to clinical trials. The papers selected were then summarized using the Grading of Recommendations Assessment, Development and Evaluation method. For RBC transfusion thresholds, 11 RCTs included 1,257 participants and compared restrictive thresholds (transfusion not indicated until the hemoglobin is 7.0 g/dL) with liberal thresholds (transfusion indicated at the hemoglobin level of 9.0 g/dL). The summary estimates across trials demonstrated that restrictive RBC transfusion thresholds were not associated with higher rates of adverse clinical outcomes, including 30-day mortality, myocardial infarction, cerebrovascular accident, rebleeding, pneumonia, or thrombocytopenia. For RBC storage duration, 13 RCTs included 6,303 participants randomly allocated to receive fresh blood or standard-issue blood. These RCTs demonstrated that fresher blood did not improve clinical outcomes.

Findings

It is good practice to consider the hemoglobin level, the overall clinical context, patient preferences, and alternative therapies when making transfusion decisions regarding an individual patient. Recommendation 1: a restrictive RBC transfusion threshold in which the transfusion is not indicated until the hemoglobin level is 7.0 g/dL is recommended for hospitalized adult patients who are hemodynamically stable, including critically ill patients, rather than when the hemoglobin level is 10.0 g/dL (strong recommendation, moderate quality evidence). A restrictive RBC transfusion threshold of 9.0 g/dL is recommended for patients undergoing orthopedic surgery, cardiac surgery, and those with preexisting cardiovascular disease (strong recommendation, moderate quality evidence). The restrictive transfusion threshold of 7.0 g/dL is likely comparable with 9.0 g/dL. The RCT evidence is not available for all patient categories. These recommendations do not apply to patients with acute coronary syndrome, severe thrombocytopenia (patients treated for hematological or oncological reasons who are at risk of bleeding), and chronic transfusion-dependent anemia (not recommended due to insufficient evidence). Recommendation 2: patients, including neonates, should receive RBC units stored at any point within their licensed dating period (standard issue) rather than limited to transfusion of only fresh stored blood (<10 days) RBC units (strong recommendation, moderate quality evidence).

Conclusions and Relevance

Research in RBC transfusion medicine has significantly advanced the science in recent years and provides high-quality evidence to inform guidelines. A restrictive transfusion threshold is safe in most clinical settings and the current blood banking practices of using standard-issue blood should be continued.

Published online October 12, 2016.
Evidence Based Transfusion

- **Red Blood Cell Transfusion: A Clinical Practice Guideline From the AABB 2012**

- **Recommendation 1:** The AABB recommends adhering to a restrictive transfusion strategy (7 to 8 g/dL) in hospitalized, stable patients
  - Grade: strong recommendation; high-quality evidence.

- **Recommendation 2:** The AABB suggests adhering to a restrictive strategy in hospitalized patients with preexisting cardiovascular disease and considering transfusion for patients with symptoms or a hemoglobin level of 8 g/dL or less
  - Grade: weak recommendation; moderate-quality evidence.

Evidence Based Transfusion

- Red Blood Cell Transfusion: A Clinical Practice Guideline From the AABB 2012

- **Recommendation 3:** The AABB cannot recommend for or against a liberal or restrictive transfusion threshold for hospitalized, hemodynamically stable patients with the acute coronary syndrome
  - Grade: uncertain recommendation; very low-quality evidence.

- **Recommendation 4:** The AABB suggests that transfusion decisions be influenced by symptoms as well as hemoglobin concentration
  - Grade: weak recommendation; low-quality evidence.

Recommendation 1:

- **Restrictive threshold of 7g/dL**
  - Hospitalized adult patients who are hemodynamically stable
  - Includes critically ill patients

- **Restrictive threshold of 8g/dL**
  - Orthopedic surgery
  - Cardiac surgery
  - Pre-existing cardiovascular disease
Recommendation 2:

- RBC units should be standard issue rather than limiting patients to transfusion of only fresh RBCs
  - Includes neonates
  - Defines fresh as <10 days
What is Patient Blood Management?

- Patient centered
- Anemia management
- Conservation of blood
- Coagulation
Blood Conservation

- Surgical techniques
- Perioperative donation
- Blood recovery
- Other adjunctive techniques
What is Patient Blood Management?

- Patient centered
- Anemia management
- Conservation of blood
- Coagulation
Coagulation

- Evaluate BOTH qualitative and quantitative measures for coagulation factor function
- True cause of dysfunction
- Goal directed therapies
- Plasma transfusion if evidence based
Coagulation
Coagulation

- Evaluate BOTH qualitative and quantitative measures for coagulation factor function

- True cause of dysfunction

- Goal directed therapies

- Plasma transfusion if evidence based
Evidence-based practice guidelines for plasma transfusion 2010

Question 1: Should plasma transfusion (vs. no plasma) be used in trauma patients requiring massive transfusion?

- Recommendation: Suggest that plasma be transfused to trauma patients requiring massive transfusion
- Quality of evidence: moderate

Evidence Based Transfusion

- Evidence-based practice guidelines for plasma transfusion 2010

- Question 2: Should a plasma:RBC transfusion ratio of 1:3 or more (vs. <1:3) be used in trauma patients requiring massive transfusion?

  - Recommendation: Cannot recommend for or against
  - Quality of evidence: low
    - Observational studies

Evidence-based practice guidelines for plasma transfusion 2010

Question 3: Should plasma transfusion be used in surgical and/or trauma patients in absence of massive transfusion?

- Recommendation: Cannot recommend for or against (69% against, remainder uncertain)
- Quality of evidence: very low

Evidence-based practice guidelines for plasma transfusion 2010

Question 4: Should plasma transfusion be used for patients with warfarin anticoagulation-related intracranial hemorrhage?

- Recommendation: Suggest that plasma be transfused (87% for)
- Quality of evidence: low
Question 5: Should plasma transfusion be used to reverse warfarin anticoagulation in patients without ICH?

- Recommendation: Cannot recommend for or against (62% against)
- Quality of evidence: very low

Evidence-based practice guidelines for plasma transfusion 2010

Question 5: Should plasma transfusion be used to reverse warfarin anticoagulation in patients without ICH?

- Recommendation: Cannot recommend for or against (62% against)
- Quality of evidence: very low

Patient Blood Management

Why do we care?
Benefits of Patient Blood Management

- Conserves supply
- Significant cost savings
- Better for the patient
- Makes Joint Commission happy
Conserve Supply

Cost Savings

Annualized Cost Avoidance for FY16 vs. FY14

<table>
<thead>
<tr>
<th></th>
<th>RBCs</th>
<th>Platelets</th>
<th>Plasma</th>
</tr>
</thead>
<tbody>
<tr>
<td>$</td>
<td>-$1,000,000</td>
<td>-$400,000</td>
<td>$0</td>
</tr>
<tr>
<td>$</td>
<td>-$900,000</td>
<td>-$300,000</td>
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**total = $1.25 million**
**Better for the Patient**

Randomized Clinical Trials Supporting Levels of 7-8


Patient Outcomes When Transfused at Higher Triggers

- Same
- Same/Worse
- Same
- Worse
- Same
- Same/Worse
- Same
Makes JC Happy

- Background
- JCAHO
  - Standards
    - Set forth expectations and used as a tool to assess adherence to those expectations
  - Performance measures
    - Supplemental guide used during assessment
    - Provides specific measurement tools during the accreditation survey
Background
Development

- Asked for public comment
  - 89 measures submitted
  - Committee (Technical Advisory Panel—TAP) reviewed and revised
- 19 chosen in 2008 and put out for stakeholder review and comment
  - Reduced to 10 measures and defined how they would be evaluated
- Alpha testing in 2009
  - 7 measures resulted
## Performance Measures for Blood Management

<table>
<thead>
<tr>
<th>#</th>
<th>Measure Name</th>
<th>Numerator</th>
<th>Denominator</th>
<th>Included Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>BM-1</td>
<td>Transfusion Consent</td>
<td>Patients with signed consent who received info about risks, benefits and alternatives prior to the initial transfusion</td>
<td>Patients who received blood transfusions</td>
<td>Count of all patients who received blood transfusions using ICD-9 codes</td>
</tr>
</tbody>
</table>

If you are accredited by AABB, you already do this.  
AABB Standard 5.19.1
## Performance Measures for Blood Management

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<th>Included Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>BM-2</td>
<td>RBC Transfusion Indication</td>
<td>Number of transfusion events with pretransfusion HGB or HCT and clinical indication documented</td>
<td>Number of RBC transfusion events</td>
<td>Count of all patients</td>
</tr>
<tr>
<td></td>
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</tr>
<tr>
<td>BM-3</td>
<td>Plasma Transfusion Indication</td>
<td>Number of transfusion events with pretransfusion laboratory values and clinical indication documented</td>
<td>Number of plasma transfusion events</td>
<td>Count of all patients</td>
</tr>
</tbody>
</table>

- EMR or paper forms
  - Clinical indications???
- What criteria does your BBK have in place for audits currently?
Multiple studies have demonstrated that in absence of fever and bleeding, threshold of 10,000 is as safe as 20,000 in preventing severe bleeding and mortality.

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</tr>
</thead>
<tbody>
<tr>
<td>BM-4a</td>
<td>Platelet Transfusion Indication</td>
<td>Number of transfusion events with platelet testing and clinical indication documented</td>
<td>Number of platelet transfusion events</td>
<td>Count of all patients</td>
</tr>
<tr>
<td>BM-4b</td>
<td>Prophylactic Platelet Transfusion Indication</td>
<td>Number of transfusion events with pretransfusion count ≤ 10,000/uL and clinical indication documented</td>
<td>Number of platelet transfusion events</td>
<td>Count of all patients</td>
</tr>
</tbody>
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## Performance Measures for Blood Management

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</tr>
</thead>
<tbody>
<tr>
<td>BM-5</td>
<td>Blood administration documentation</td>
<td>Number of transfusion units (bags) with the following documented</td>
<td>Number of RBC, plasma and platelet bags evaluated</td>
<td>Count of all patients</td>
</tr>
<tr>
<td></td>
<td></td>
<td>*Pt ID and order confirmation prior to initiation of transfusion</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>*Date and time of transfusion</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>*BP and temp recorded pre, post and during transfusion</td>
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- **Patient safety initiative**
#### Performance Measures for Blood Management

**May be the most difficult measure to initiate**

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<tbody>
<tr>
<td>BM-6</td>
<td>Preoperative Anemia Screening</td>
<td>Patients with preoperative anemia screening 14-45 days before anesthesia start date</td>
<td>Selected elective surgical patients Excluding: *patients with pre-op anemia screening &lt; 14 days prior to surgery *patients &lt;18 years of age</td>
<td>Cardiac, ortho and hysterectomy elective surgeries</td>
</tr>
</tbody>
</table>
# Performance Measures for Blood Management

- **Patient safety initiative**
- **My personal favorite**

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>BM-7</td>
<td>Preoperative Blood Type Screening</td>
<td>Patients with preoperative type and crossmatch or type and screen completed prior to anesthesia start time</td>
<td>Selected elective surgical patients Excluding: *patients without a pre-op order for T&amp;S or T&amp;C *patients &lt;18 years of age</td>
<td>Selected elective surgeries</td>
</tr>
</tbody>
</table>
What Happened?

- Not currently used as performance measures
- JCAHO decided to join forces with AABB
  - “Patient Blood Management Certification Program”
Is PBM Certification for You?

- Must have buy in:
  - Medical director of the blood bank
    - Technical supervisor
    - Quality officer
  - Hospital clinicians
    - Heme/Onc
    - Surgery
    - Anesthesia
    - ED
Team Approach, continued

- Nursing
- Lab
  - Clinical lab
  - Blood bank
- IT
- Hospital administration
- Risk management
Once you have the Who...

- Start looking at the How...
  - Perform audits
  - Find strengths and weaknesses

- Explore alternatives
  - Clinician investment a must
  - Pre-op, Intra-op, and Post-op phases all present opportunities for improved blood management

- Educate
What if nobody cares?

- Do what is in your power
- Laboratory Blood Management
- Find and fix inefficiency
Blood product wastage is an important and costly issue for transfusion services. Platelet wastage is of special concern due to its short expiration time, making it a particularly precious product. Frequent shortages in supply occur, making it a time commitment of platelet donors. Platelet products were determined to be the most costly source of wastage for our transfusion service. In-date platelet wastage generally occurs in areas outside of the blood bank’s authority. Wastage due to out-dating (expiration) was targeted as an area for improvement. Six Sigma was chosen as the methodology to decrease platelet wastage. Inexpensive, familiar to many laboratory staff, data driven with focus on process improvement, structured DMAIC—Define, Measure, Analyze, Improve and Control—were the key aspects of the methodology.

**BACKGROUND**
- Blood product wastage is an important and costly issue for transfusion services.
- Platelet wastage is of special concern due to its short expiration time, making it a particularly precious product.
- Frequent shortages in supply occur, making it a time commitment of platelet donors.
- Platelet products were determined to be the most costly source of wastage for our transfusion service.
- In-date platelet wastage generally occurs in areas outside of the blood bank’s authority.
- Wastage due to out-dating (expiration) was targeted as an area for improvement.
- Six Sigma was chosen as the methodology to decrease platelet wastage.

**METHODS**
- **Define** the opportunity for improvement:
  - Inexpensive, familiar to many laboratory staff.
  - Data driven with focus on process improvement.
  - Structured DMAIC—Define, Measure, Analyze, Improve and Control.
- **Measure** the process performance:
  - Three years of data was examined.
  - Transfused vs Inventory vs Expired.
- **Analyze** the process to determine root causes of poor performance:
  - Average platelet wastage 3.2%, goal wastage <2%.
  - Goal inventory was too high based on historical numbers.
- **Improve** the process performance by addressing root causes:
  - Goal inventory was decreased to match actual historical transfusion numbers.
  - Standing orders were eliminated (except weekend) and blood supplier notified that daily ordering would occur.
  - A formula was devised based on data derived during the “Measure” phase.
  - Goal Inventory = Working Inventory (WI) = # to Order
    - WI = Yesterday’s inventory + Standing order – Yesterday’s usage
- **Control** the improved process:
  - Monitor platelets expired monthly, investigate elevations.
  - Celebrate successes with blood bank staff.

**RESULTS**
- **Define** the opportunity for improvement:
  - Prior to implementation of the formula an average of 714 platelets/month were dispensed with average wastage of 3.2%.
  - Decrease far exceeded expectations!
  - Four of the five months examined had zero wastage.
  - Over the first five months, an estimated $53,200 was saved.
  - Annualized this would equal over $127,000.
- **Control** phase has shown that the system is easily maintained.
  - Using Six Sigma methodology was an effective, low cost technique to reduce platelet wastage.
  - While all institutions can use our formula, not all may obtain the same results for platelet wastage.
  - The “control” portion of the Six Sigma method is essential for the longevity of this initiative.

**Example:**
\[
25 - (16+10-13) = 12
\]

**Goal Inventory**
- Average platelet wastage 3.2%, goal wastage <2%.
- Goal inventory was too high based on historical numbers.
- Standing orders with the blood supplier did not decrease in response to changes in transfusion numbers.

**Working Inventory**
- Inexpensive, familiar to many laboratory staff.
- Data driven with focus on process improvement.
- Structured DMAIC—Define, Measure, Analyze, Improve and Control.

**goal Inventory**
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- While all institutions can use our formula, not all may obtain the same results for platelet wastage.
- The “control” portion of the Six Sigma method is essential for the longevity of this initiative.
Useful Resources

- Society for the Advancement of Blood Management
  - [www.sabm.org](http://www.sabm.org)

- JCAHO
  - [https://www.jointcommission.org/certification/patient_blood_management_certification.aspx](https://www.jointcommission.org/certification/patient_blood_management_certification.aspx)

- AABB
  - [http://www.aabb.org/sa/Pages/affiliated-accrediting-organizations.aspx](http://www.aabb.org/sa/Pages/affiliated-accrediting-organizations.aspx)
Questions?