Patient Blood Management: Exploring the Options

Heather E. Mingo RN, SNP
Perioperative Blood Management Services
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Conflict of Interest

- I have no financial relationships or involvement with industry to disclose.
- I will not discuss off label use and/or investigational use in my presentation.
Objectives

– Define blood management and discuss its importance
– Educate about alternative strategies to blood transfusion
– Discuss the care of the Jehovah’s Witness
Patient Blood Management (PBM)

The timely application of evidence-based medical and surgical concepts designed to maintain hemoglobin concentration, optimize hemostasis and minimize blood loss in an effort to improve patient outcomes.

SABM, 2010
Why Blood Management?

- Facilitate transfusion avoidance and optimize blood management in elective surgical patients
- Enhance transfusion practice outside of blood bank
- Interact with physicians, nurses and patients to promote blood management & alternatives to transfusion
“IT HAS A DOCTORS HEAD, NURSES ARMS AND ADMINISTRATORS LEGS. UNFORTUNATELY, IT DOESN'T HAVE ENOUGH ARMS TO DO THE WORK THE HEAD WANTS, AND THE LEGS REFUSE TO STAND UNTIL A COMMITTEE IS FORMED TO FIND OUT WHY NOTHING IS GETTING DONE.”
How is Blood Management Accomplished?

Identify at risk population

Krever recommendations:

• Consider transfusion alternatives for elective surgical patients (>10% risk of transfusion)

Why perioperative patients?

• 50-70% of blood products used in hospitals are used in the perioperative setting (Hebert et al, 2004)

• Potential exists to modify some predictors of transfusion in elective surgical patients

• Pre-op Hgb, Blood loss

• Wide variation in transfusion practice for procedures
Why is the Optimization of Preop Hgb important?

- Preop Hgb is one of the most important predictors of the need for blood transfusion in patients undergoing elective surgery\(^1\).

- Optimization of preop Hgb reduces the need for transfusion.

How is Blood Management Accomplished?

Pre-op Hgb optimization:
4-6 week lead time for assessment, screening and appropriate interventions:
• Careful attention to patient medical history, pre op meds
  ASA, Clopidrogel (Plavix), NSAIDs, herbal supplements
• Correction of nutritional anemia
  Iron therapy - dietary advice, supplements - Vit B12, Folate
• Pre operative autologous donation (PAD)
• Erythropoietin therapy
• ? Delay surgery
## Dietary Sources of Iron

### Iron Dietary Goals

1. Eat at least one food high in iron at each meal.
2. Vitamin C helps your body absorb more iron. Try to eat Vitamin C-rich foods: orange juice, tomatoes, broccoli, potatoes, citrus fruits and juices, and dark green leafy vegetables.
3. Coffee and tea decrease iron absorption. Limit consumption of coffee and tea.
4. Use cast iron cookware.
5. Eat more iron-fortified and enriched grain products.

### Best Sources of Iron

<table>
<thead>
<tr>
<th>Best</th>
<th>Good</th>
<th>Fair</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liver</td>
<td>Lean meat and turkey</td>
<td>Egg yolk</td>
</tr>
<tr>
<td>Heart</td>
<td>Tuna &amp; mackerel</td>
<td>Bread (enriched)</td>
</tr>
<tr>
<td>Kidney</td>
<td>Dried apricots, prunes, fig, Raisins</td>
<td>Cereals (enriched)</td>
</tr>
<tr>
<td>Cream of wheat</td>
<td>Liverwurst</td>
<td>Blackberries</td>
</tr>
<tr>
<td>Cereals:</td>
<td>Tofu</td>
<td>Strawberries</td>
</tr>
<tr>
<td>Farina (enriched)</td>
<td>Beans (ex: lentils lima, chickpeas)</td>
<td>Watermelon</td>
</tr>
<tr>
<td>Cream of Wheat, Product 19,</td>
<td>Spinach, boiled</td>
<td>Black-eyed peas</td>
</tr>
<tr>
<td>Grape nuts,</td>
<td>Lima beans</td>
<td>Green peas</td>
</tr>
<tr>
<td>Total</td>
<td>Nuts (cashews, Brazil, walnuts)</td>
<td>Sunflower seeds</td>
</tr>
<tr>
<td></td>
<td>Blackstrap molasses</td>
<td>Peanut butter</td>
</tr>
<tr>
<td></td>
<td>Shrimp, Oysters &amp; clams</td>
<td>Kale</td>
</tr>
<tr>
<td></td>
<td>Anchovies</td>
<td>Collards</td>
</tr>
</tbody>
</table>
Iron Supplements

- Oral
  - Ferrous Gluconate 35 mg
  - Ferrous Sulfate 60 mg
  - Ferrous Fumarate 100 mg

- IM
  - Jectofer - Iron Sorbitol
  - DexIron/Infufer Iron Dextran

- IV
  - DexIron/Infufer Iron Dextran
  - Venofer - Iron Sucrose
PAD Program

• A decade ago, major modality for many centres
• >50% of collected units were routinely wasted
• **Patients become anemic pre-operatively**
• OR slates constantly changing and PAD blood outdating
• Good for 42 days only and old blood is not good for your patient
Erythropoietin is a naturally occurring hormone produced primarily in the kidney and is the principal regulator of red blood cell production.

EPREX* is a recombinant human erythropoietin that contains the same amino acid sequence of isolated natural erythropoietin.
Epoetin alfa is indicated for:

- the treatment of anemic patients (Hgb >100 to 130 g/L) scheduled to undergo elective, noncardiac, nonvascular surgery to reduce the need for allogeneic blood transfusions.
- patients at high risk for perioperative transfusions with significant, anticipated blood loss.

Epoetin alfa monograph
Iron with ESA Use

• “When erythropoietin (epoetins or darbepoetin) is used to treat the anemias of chronic renal failure, cancer chemotherapy, inflammatory bowel diseases, HIV infection and rheumatoid arthritis, functional iron deficiency rapidly ensues unless individuals are iron-overloaded from prior transfusions. Therefore, iron therapy is essential when using erythropoietin to maximize erythropoiesis by avoiding absolute and functional iron deficiency.”

Intraoperative Management

Manipulation of Losses
- Cell salvage
- Acute Normovolemic Hemodilution
- Controlled Hypotension
- Hypervolemic Hemodilution
- Selective Embolization

Pharmacologic
- Antifibrinolytics
- DDAVP
- fVIIa
- Octaplex
- Fibrinogen

Other
- Appropriate Transfusion Trigger, Normothermia, Surgical technique, Regional anesthetic, Tourniquets, Positioning, Fibrin Sealants, etc
Cell saver
- collection, processing, brief storage, and IV return of shed blood

**Downsides:**
- Cost
- Availability
- Cancer
- Contaminated field
Acute Normovolemic Hemodilution (ANH)

- Removal of 1, 2 or more units of blood before surgery begins
- Phlebotomized blood is replaced with IV fluid
- Patient’s blood is stored until the end of surgery then reinfused

Downsides:
- Time
- ?evidence
- Case selection
Platelet Glue

Platelet rich plasma or platelet glue is the ‘latest’ innovation. Was first described in 1972 & used in cardiac surgery since 1990s. Recently in dental, oral and plastic surgery.

- Has 2-4x more platelets than plasma. The platelets provide a wealth of healing & growth factors.
- Can be collected and produced by perfusionists or trained lab/nursing personnel.
Anti-fibrinolytics

- Traditionally used in cardiac surgery due to blood loss but now being incorporated into orthopedic surgery
- Inhibits fibrinolysis by blocking lysine-binding sites of plasminogen to fibrin.
- Tranexamic Acid (TEA)
- In TEA trials, a significant 48% relative risk reduction in allogeneic transfusion.
- Timing of administration is a question of current study
Colloids

- Synthetic starch colloids widely used for plasma volume expansion and are highly effective.
- Primarily excreted by the kidney
- Currently available:
  - Voluven (Fresenius Kabi)
  - Pentaspan (Bristol Meyers Squibb)
A word about Albumin…

- Albumin is NOT superior to crystalloid for treatment of hypovolemia.
- Albumin is a blood product and it is not ‘matched’ and the risk of prion disease transmission exists.

**COSTS:**
- 5% albumin $117
- Voluven/ Pentaspan $56
- Saline $2
Postoperative Management

Assessment and tolerance of anemia
  - transfusion triggers
  - Optimal fluid and volume management
    - Some symptoms attributed to anemia, may be volume-related (not oxygen carrying capacity)
  - Iron supplementation
  - Antifibrinolytics
  - Maintenance of normothermia
  - Scrutinized use of phlebotomies
Iatrogenic Anemia

• Anemia caused by hospitalization procedures not by patient illness
• Diagnostic phlebotomy major cause
  • Studies record daily blood losses of 50-90ml!
  • Accounts for 30-50% of transfusions in ICU

Corwin et al. Chest 1995
Preventing Iatrogenic Anemia

- Reduce blood sample size (point of care)
- Return dead space blood loss
- Reduce the # of indwelling catheters
- Eliminate “standing orders” for blood tests
Care of the Jehovah’s Witness
Patient Background

- Jehovah’s Witnesses - a Christian Religion
- 6 million active followers worldwide
- All follow a strict religious conviction against the acceptance of blood or blood products
- Based on a strict Bible interpretation that blood is sacred and represents life of the organism
ONCE REMOVED FROM THE BODY, BLOOD CANNOT BE REPLACED!!!
Allogeneic transfusion and Autologous Donation
- non negotiable

• **Will accept:**
  • Non human volume expanders
  • Intraoperative cell salvage*
  • Acute normovolemic hemodilution*
  • Bypass and extra corporeal circulation*
  • All new surgical methods for hemostasis
  • Albumin**
  • Immune globulin**
  • “Hemophiliac preparations”**
  * Certain criteria must be met for acceptance
  ** Area of “personal decision”
SUMMARY

- Medical ethics systems apply to all patients
- Treatment of the J.W. patient should be the same as all other patients seeking medical care with one exception
- Access to ‘bloodless’ care should be available as should chemotherapy or any other specialized care that is available to all patients
- Legally protected and ethically sound; the patient’s rights to bodily self determination!
Conclusions

• Early assessment is crucial to management of preop anemia
• Anemia is prevalent in hospitalized patients and it drives RBC transfusion.
• IDA and ACD are the most common in surgical populations
• Iron, either oral or intravenous (IV iron) can correct anemia in most patients.
• IV iron can increase Hgb levels by 1.5 - 2 gm/dL in 1 week
• Oral iron just takes time and patience.
  – START optimization EARLY!
• Both epo and IV iron can decrease RBC transfusion in surgical patients.
Thank you
Contact Information

QEII Health Sciences Centre
Rm. 5607  5th Floor
Halifax Infirmary site

• Phone  (902) 473-3117
• Cell    (902) 233-1344
• Email heather.mingo@cdha.nshealth.ca