

The Credit Valley Hospital – CLINICAL PRACTICE GUIDELINES

Folder Name: Clinical Practice Guidelines
Date of Issue: 4/26/2010
Issued By: Dr. Mathias Gysler, Chief of Medical Staff

Title: Blood Conservation - Adult CPG

PURPOSE

To provide guidelines for the practice of Blood Conservation in the adult population.

The aim is to reduce the need for red blood cell transfusion in those patients where transfusion can be avoided through the use of other treatment modalities and interventions.

SELECTION CRITERIA

Adults who are at risk of requiring blood transfusion: perioperative patients, ante-natal, post-natal, gynaecological, medical patients and adults declining transfusion due to personal/religious beliefs.

DEFINITION

Blood Conservation refers to strategies aimed at appropriate alternatives to blood transfusion and the appropriate use of blood products. The World Health Organization (WHO) defines appropriate transfusion as: 'to treat a condition leading to significant morbidity and mortality that cannot be prevented or managed effectively by other means'.

GUIDING PRINCIPLES

1. There are inherent risks associated with blood transfusion
2. Blood conservation methods provide alternatives to transfusion
3. Blood conservation provides the patient with an opportunity to make an informed choice about care and management
4. Patient education, planning and timely interventions may reduce recovery time
5. The banked blood supply is limited

ASSESSMENT AND TREATMENT

Individual patient assessment should determine most appropriate blood conservation strategies based on each clinical situation. At minimum Hemoglobin (Hgb) and Ferritin levels should be obtained before initiating treatment, to confirm current iron deficiency and/or anticipated insufficiency to meet upcoming demands of surgery/procedures. Where underlying anemia exists of unknown origin, clinical investigation is indicated.

Treatment options to avoid the need for transfusion include:

1. Iron Rich Diet

- recommended for patients with iron deficiency where time allows for a slow restoration of iron and iron stores (see **Appendix A** Iron Rich Diet)

2. Oral Iron Supplements

- indicated for prevention and treatment of iron deficiency anemia
 - useful pre and post operatively to build / restore iron levels
- 2.1 Drug Interactions → methyldopa (Aldomet), most antibiotics, levothyroxine
* **allow at least a 2 hour interval between ingestion of iron and these medications**
 - 2.2 Oral Iron products are heme or non-heme based and vary in tolerability, absorption and amount of available elemental iron. Selecting the correct iron product is important in order to derive the best results.
(see **Appendix B** Common Oral Iron Supplements)
 - 2.3 Non-heme Iron absorption can be blocked or inhibited by the following:
 - calcium
 - antacids
 - proton pump inhibitors
 - Tannic acid (in tea, coffee, nuts etc)
 - Legumes, whole grains, soy products
 - 2.4 Non-heme iron absorption is enhanced by vitamin C
 - 2.5 Heme iron absorption is not affected by diet and tends to be well tolerated

3. Intravenous Iron Sucrose (Venofer)

- considered when oral iron is inadequate (mal-absorption, intolerance, limited time, very low iron stores, more rapid correction of low hemoglobin required)
- intravenous iron may be considered as an adjunctive therapy to erythropoietin (Eprex®) when Ferritin level (eg below 30mcg/L) is too low to support the additional iron requirements of erythropoietin therapy
(see **Appendix C** Iron Sucrose (Venofer) Dosage and Indications)

4. Erythropoietin (Eprex®)

- indicated to treat patients undergoing major elective surgery where there is an expected moderate blood loss **and** where the pre-treatment Hemoglobin is less than 125 g/L
- may be used in other clinical situations to avoid blood transfusion, in the presence of iron deficiency anemia; Ferritin level should be above 30 mcg/L in order to be effective
- clinical assessment required to determine individual suitability for treatment
- patient must take iron during treatment (oral or intravenous)
- Ontario Drug Benefit Program (ODBP) applications will be submitted by the blood conservation coordinator for funding consideration under the Exceptional Access Program
- Compassionate Eprex® is available under special circumstances and will be arranged by the blood conservation coordinator

Erythropoietin should not be used if Hgb 130 g/L or above
(See **Appendix D** Erythropoietin Indications Contraindications and Treatment)

5. Autologous Blood Donation

- should be considered on an individual basis
- not recommended less than 2 weeks prior to surgery
- patients must take oral iron supplements
- surgeon must sign requisition for Canadian Blood Services

Autologous donation is a strategy utilized less frequently, as the goal of blood conservation is to build Hgb particularly in the preoperative period, rather than deplete resources. Mounting evidence indicates that the benefits of stored blood are limited with increased storage time and may in fact be detrimental.

To initiate the Autologous donation process a signed requisition from the surgeon is necessary. The patient must make arrangements for donation with Canadian Blood Services and meet the requirements listed.

Canadian Blood Services Eligibility Criteria Autologous Blood Donation

1. Age – adults age 17 to 71
2. Weight minimum 50 kg/110 lbs
3. Physician Referral signed and completed
4. Cardiac conditions – full report required and patient is also screened by the Canadian Blood Services Medical Director
5. Oral iron supplements
6. Initial Hemoglobin must be minimum 110 g/L and subsequent donations 105 g/L (Preoperative blood conservation recommendation is not less than 130 g/L initially, in order to avoid depletion of iron resources)
7. Referral for autologous donation is at the discretion of the surgeon
8. For CVH the final donation is recommended to be not less than 2 weeks preoperatively

Appendix A

Iron Rich Diet: Patient-Handout

Purpose

This diet is designed to provide you with foods that are high in iron in order to prevent iron deficiency. Iron is a mineral that carries oxygen in your blood.

An iron-rich diet is needed for children, adolescents and adults who may not be getting enough in their diet, and before or after surgery to help achieve a faster recovery. It is also needed for people with higher iron needs such as pregnant and premenopausal women and some athletes.

About Iron

There are two types of iron in food – heme iron and non-heme iron.

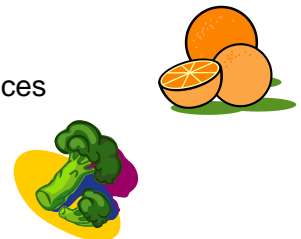
Heme iron is found mainly in meat, poultry and fish. This type of iron is more easily absorbed by the body than non-heme iron.



Non-heme iron is found in beans, grains, nuts, and some fruits and vegetables. Absorption of non-heme iron is enhanced when plant sources of iron are eaten with meat/fish/poultry or foods containing vitamin C.

Foods that help enhance iron absorption

- Meat, poultry, fish
- **Fruits:** oranges, orange juice, cantaloupe, strawberries, grapefruit, juices enriched with vitamin C
- **Vegetables:** broccoli, brussel sprouts, tomato, tomato juice, potatoes, green and red peppers, raw cabbage



Foods that may decrease iron absorption

Avoid having coffee or tea with meals as it may decrease iron absorption.





Recommended Dietary Allowances for Iron

Females

19 – 50 years	18 mg/day
Over 50 years	8 mg/day
Breastfeeding	10 mg/day
Pregnant	27 mg/day

Males

Over 19 years	8 mg/day
---------------	----------

Excellent Sources of Iron (3.5 mg or more)	Good Sources of Iron (2.1 mg or more)	Sources of Iron (0.7 mg or more)
Heme Iron		
Clams, oysters Liver – beef or chicken	Beef, cooked Blood pudding Turkey, dark meat 	Chicken, ham, lamb, pork, veal Halibut, haddock, perch Salmon - canned or fresh Shrimp, tuna Egg
Non-heme		
Cooked beans – white beans, soybeans, lentils, chickpeas Enriched breakfast cereals Tofu 	Canned lima, red kidney beans, chickpeas, and split peas Cooked enriched egg noodles Dried apricots	Peanuts, pecans, walnuts, pistachios, roasted almonds, roasted cashews, sunflower seeds Cooked pasta, egg noodles Bread Pumpernickel bagel, bran muffin Cooked oatmeal Wheat germ Canned beets, drained Canned pumpkin Dried seedless raisins, peaches, prunes, apricots

Nutrition Facts	
Serving Size 2 crackers (14 g)	
Servings Per Container About 21	
Amount Per Serving	
Calories 60	Calories from Fat 15
% Daily Value*	
Total Fat 1.5g	2%
Saturated Fat 0g	0%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 70mg	3%
Total Carbohydrate 10g	3%
Dietary Fiber Less than 1g 3%	
Sugars 0g	
Protein 2g	
Vitamin A 0% • Vitamin C 0%	
Calcium 0% • Iron 2%	
* Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:	
Calories: 2,000 2,500	
Total Fat	Less than 65g 80g
Sat Fat	Less than 20g 25g
Cholesterol	Less than 300mg 300mg
Sodium	Less than 2400mg 2400mg
Total Carbohydrate	300g 375g
Dietary Fiber	25g 30g

Reading Food Labels:

- Most pre-packaged foods have a **Nutrition Facts** table.
- The information on a food label is based on a **specific amount of food**.
- The **% daily value** helps you see if there is a little or a lot of a nutrient.
- Vitamin C and Iron must be listed on all Nutrition Facts tables.
- A **% daily value** of 15% or more would be high in iron.
- A **% daily value** of 30% or more would be high in Vitamin C.

Appendix B

Common Oral Iron Preparations

Brand Name	Preparation	Supplied	Amount of Elemental Iron	Common Side Effects	Clinical Considerations
Euro-Fer®	Ferrous Fumarate (iron salt)	300 mg	100 mg (33%)	constipation/diarrhea, stomach upset, heartburn	-best absorption when taken on an empty stomach with vitamin C (eg juice)
Palafer®	Ferrous Fumarate (iron salt)	300 mg	100 mg (33%)	constipation/diarrhea, stomach upset, heartburn	-best absorption when taken on an empty stomach with vitamin C (eg juice)
Apo-Ferrous Gluconate®	Ferrous Gluconate (iron salt)	300 mg	35 mg (11.6%)	constipation/diarrhea, stomach upset, heartburn	-best absorption when taken on an empty stomach with vitamin C (eg juice)
Apo-Ferrous Sulphate®	Ferrous Sulphate (iron salt)	300 mg	60 mg (20%)	constipation/diarrhea, stomach upset, heartburn	-best absorption when taken on an empty stomach with vitamin C (eg juice)
Fera Max®	Poly Saccharide Iron Complex	150 mg	150 mg	reduced side effects (constipation/diarrhea, stomach upset, heartburn)	- taken with or without food
Proferrin®	Heme Iron Polypeptide *natural product from animal sources	398 mg	11 mg	well tolerated, side effects rare	-taken with or without food -high absorption -not suitable for vegan diet

***Antibiotics, methyldopa (Aldomet®) and levothyroxine should not be taken with iron;
allow 2 hours between administration**

Heme iron is approximately 3 times more bio-available than non-heme products and is therefore more readily and efficiently absorbed than non-heme irons.

Non-heme iron absorption is affected by a variety of factors, such as diet, medications, existing iron stores, clinical situation. The effectiveness of non-heme irons is reduced by calcium, antacids, proton pump inhibitors, some whole grains and legumes.

Appendix C

Iron Sucrose (Venofer®) Dose and Infusion

Intravenous (IV) iron sucrose is a blood conservation strategy used for patients with iron deficiency anemia and low iron stores (ferritin). IV iron is used when oral iron is not tolerated, when there is an inadequate response to oral supplements or when a more urgent correction of anemia is required. IV iron sucrose is also useful as an adjunct therapy to erythropoietin.

Iron sucrose contains 100 mg of elemental iron per 5 mL.

Iron Sucrose Dose Calculation:

(weight in kg) x (desired Hgb – present Hgb) x 0.24 + 500 mg = Total mg required

Infuse in divided doses with maximum dose of 300 mg preferred; should not exceed 600 mg per week.

Individual infusions up to 300 mg are generally very well tolerated.

Infusion:

100 mg in 100 ml Normal Saline infused over 30 minutes

200 mg in 250 ml Normal Saline infused over 1 hour

300 mg in 250 ml Normal Saline infused over 2 hours

Intravenous iron sucrose will reduce the efficacy of many antibiotics

Appendix D

Erythropoietin Indication / Contraindications and Treatment

Erythropoietin (Eprex®) therapy is indicated to treat patients undergoing major elective surgery with a pre-treatment hemoglobin below **125 g/L** in order to reduce the need for peri-operative allogeneic blood transfusions. Eprex® may also be utilized in other patient populations where transfusion avoidance is desired.

Contraindications:

1. Uncontrolled hypertension (greater than or equal to 180/100 mm Hg)
2. Blood disorders (pure red cell aplasia (PRCA); sickle cell; thalassemia or clotting disorders)
3. Hypersensitivity to mammalian-derived cell products, albumin or other components of the product
4. Severe coronary peripheral vascular or cerebrovascular disease
5. Recent thromboembolic or vascular events (CVA, DVT, pulmonary embolus)
6. History of cardiac disorders (unstable angina, CHF, aortic/mitral stenosis, arrhythmias)
7. Myocardial infarction within previous 6 months
8. History of seizure disorder
9. Liver disease
10. Drug and/or alcohol abuse
11. Any contraindication to anticoagulant therapy

Caution:

1. Erythropoietin may increase the risk of thrombotic vascular events
2. Should be used with caution in patients with a history of gout.
3. Individual risk/benefit assessment needed for oncology and obstetrical patients
4. Patients treated with EPREX prior to elective surgery, for the purposes of reducing the requirements for allogeneic blood transfusion, should receive adequate antithrombotic prophylaxis in order to reduce the incidence of deep venous thrombosis.

Before Treatment:

Hgb, Ferritin levels required

During Treatment:

Oral or IV iron therapy;

CBC and Reticulocyte count weekly or at appropriate intervals

BP prior to each injection

Discontinue treatment if Hgb level reaches 130 g/L or above

Adverse Reactions (uncommon):

1. Hypertension
2. Flu-like symptoms occasionally reported initially (dizziness, fever, headache, joint pain)
3. Skin rash, eczema
4. Local irritation from subcutaneous injection

Version #

Kernel Root\Credit Valley Hospital\Policies and Procedures\Clinical Documents\Clinical Practice Guidelines\

Dosage:

Weight 67 kg or more = 40,000 units x 2-3 doses*

Weight less than 67 kg = 20,000 units x 2-3 doses*

* weekly injections preferred, however may be given q 3-4 days for severe anemia - number of doses based on individual assessment (eg anticipated blood loss, present Hgb status)



REFERENCES

Anemia Institute Review, *Anemia and surgery*, Toronto, 2004.

Anemia Review Panel, *Guidelines for the management of anemia*, Guideline Clearinghouse, Toronto, 2004.

Callum, J, Pinkerton, PH, *Bloody easy, blood transfusions, blood alternatives and transfusion reactions: a guide to transfusion medicine*, Sunnybrook & WCHSC, Toronto, 2005.

Canadian Blood Services, Toronto, 2006.

Freedman, J, *Risks of blood transfusion and how to avoid them*, Toronto 2005.

Janssen-Ortho Inc. *Eprex Product Monograph*, Toronto, 2005.

Koch, C, et al, *Duration of red cell storage and complications after cardiac surgery*, New England Journal of Medicine, 2008;Vol.358:1229-1239

Napolitano, L, et al, *Clinical practice guideline: red blood cell transfusion in adult trauma and critical care*, Critical Care Medicine 2009;Vol.37:3124-3157

Pasetka, M, *Iron preparations: an overview*, Sunnybrook Health Sciences Presentation Toronto, 2009

PNBC (Physicians and Nurses for Blood Conservation), *A step by step approach to better patient care*, Mississauga, 2001.

Royal College of Physicians, *Perioperative blood transfusion for elective surgery*, Scottish Intercollegiate Guidelines Network, Edinburgh, 2001.

SABM (Society for the Advancement of Blood Management), Milwaukee, 2005.

Shandar, A, et al, *Can intravenous iron therapy meet the unmet needs created by the new restrictions on erythropoietic stimulating agents?* AABB, 2009.

The Credit Valley Hospital Registered Dietitians, *Iron rich diet*, 2006.

World Health Organization (WHO), *Blood transfusion safety: safe and appropriate use*. retrieved Jan. 11, 2010 from http://www.who.int/bloodsafety/clinical_use/en/

RELATED DOCUMENTS

Transfusion of Blood and/or Blood Products in Adults (CPG 20-2)
Physician's Orders Iron Sucrose (Adult Non-Renal)
Emergency Blood Management Plan (Pol Pro PP 5-4)

EDUCATION

The document leader will be responsible for an education plan to ensure staff members directed by the information contained in the clinical practice guideline are notified. New staff will receive education through hospital and/or department orientation.

EVALUATION

Auditing of blood usage (transfusion rates) in specific elective surgical populations as mandated by the provincial Ontario Nurse Transfusion Coordinator (ONTraC) program of the Ministry of Health and Long Term Care (MOHLTC).

Ongoing feedback/results to the Transfusion Committee as required.

Orthopaedic and Urology programs: individual surgeon, hospital and provincial comparative result reporting annually.

DEVELOPED BY

Blood Conservation Coordinator

APPROVED BY

2010-04-05 Medical Advisory Committee

SUPERCEDES

2007/04 Blood Conservation – Preoperative – Adult Elective Surgery CPG