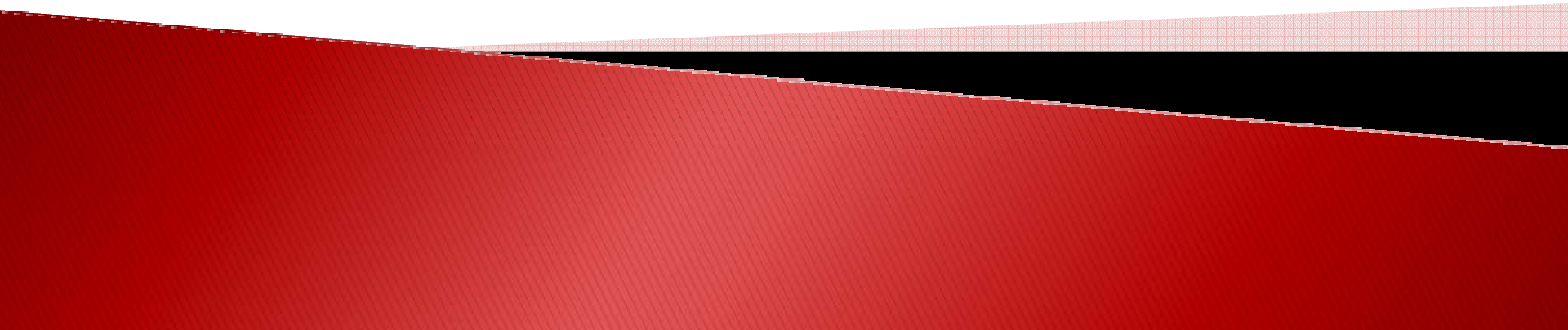


Blood Conservation Service
&
Parenteral Iron Clinic



Overview

1. Blood Conservation
 - a) Who are we,
 - b) What do we do and why?
2. Parenteral Iron Clinic

Blood Time Line

Pre-1997

1667 – First Animal to human transfusion

- First Transfusion Reaction

1818 – First Human-to-Human Transfusion

1901 – ABO grouping (1930 Nobel Prize)

1910s – 1970s - World Wars & 'Conflicts'

Late 1970s and 1980s

Tainted blood scandal in Canada

-About 1000 individuals who received blood transfusions were infected with HIV, and another 30 000 were infected with hepatitis C.

1993 Krever Commission Established

Recommendations about the transfusion of red blood cells and plasma

- 1** Patients should be informed that transfusion of red blood cells, plasma or both is a possible element of the planned medical or surgical intervention and provided with information about the risks, benefits and available alternatives.
Level of evidence: N/A
- 2** When feasible, the patient's consent to a transfusion of red blood cells, plasma or both should be obtained and recorded in the patient's medical chart.
Level of evidence: N/A
- 3** The physician overseeing the care of the patient should be responsible for obtaining informed consent for red blood cell or plasma administration.
Level of evidence: N/A
- 4** Patients should be informed that they have received a red blood cell or plasma transfusion subsequent to its administration.
Level of evidence: N/A
- 5** A physician prescribing transfusion of red blood cells or plasma should be familiar with the indications for and the benefits and risk from the use of these fractions.
Level of evidence: N/A
- 6** Documentation that supports the administration of the red blood cells or plasma should be found in the patient's chart.
Level of evidence: N/A
- 7** Red blood cell transfusions should be administered primarily to prevent or alleviate symptoms, signs or morbidity due to inadequate tissue oxygen delivery (resulting from a low red blood cell mass).
Level of evidence: II
- 8** There is no single value of hemoglobin concentration that justifies or requires transfusion; an evaluation of the patient's clinical situation should also be a factor in the decision.
Level of evidence: II
- 9** In the setting of acute blood loss, red blood cell transfusion should not be used to expand vascular volume when oxygen carrying capacity is adequate.
Level of evidence: II

- 10** Anemia should not be treated with red blood cell transfusions if alternative therapies with fewer potential risks are available and appropriate.
Level of evidence: II
- 11** Predonation of autologous blood should be considered a therapeutic option for adolescents and adults undergoing elective surgery in which the likelihood of transfusion is substantial (i.e., 10% or more).
Level of evidence: III
- 12** Indications for the transfusion of autologous blood should be the same as those for allogeneic blood.
Level of evidence: III
- 13** Plasma transfusion should be considered for patients with acquired multiple coagulation-factor deficiencies under the following circumstances.
 - a.** Plasma is recommended when serious bleeding has occurred or when preparing for an emergency surgical or invasive procedures in patients with vitamin K deficiency or on warfarin therapy with significantly increased PT, INR or aPTT.
Level of evidence: III
 - b.** Plasma is recommended when there is actual bleeding in patients with liver disease and increased PT, INR or aPTT. Plasma may be administered to prepare for surgery or liver biopsy when the results of PT, INR, aPTT or other appropriate coagulation assay are deemed sufficiently abnormal. Prophylactic plasma transfusion is not indicated for certain invasive procedures (e.g., percutaneous liver biopsy, paracentesis, thoracentesis) in patients with liver disease if their INR is 2.0 or less.
Level of evidence: III
 - c.** Plasma is recommended in patients with acute disseminated intravascular coagulation with active bleeding associated with increased PT, INR or aPTT, provided that the triggering condition can also be treated effectively.
Level of evidence: III
 - d.** Plasma should be administered in the context of massive transfusion (more than 1 blood volume) if there is microvascular bleeding associated with a significantly increased PT, INR or aPTT. If PT, INR or

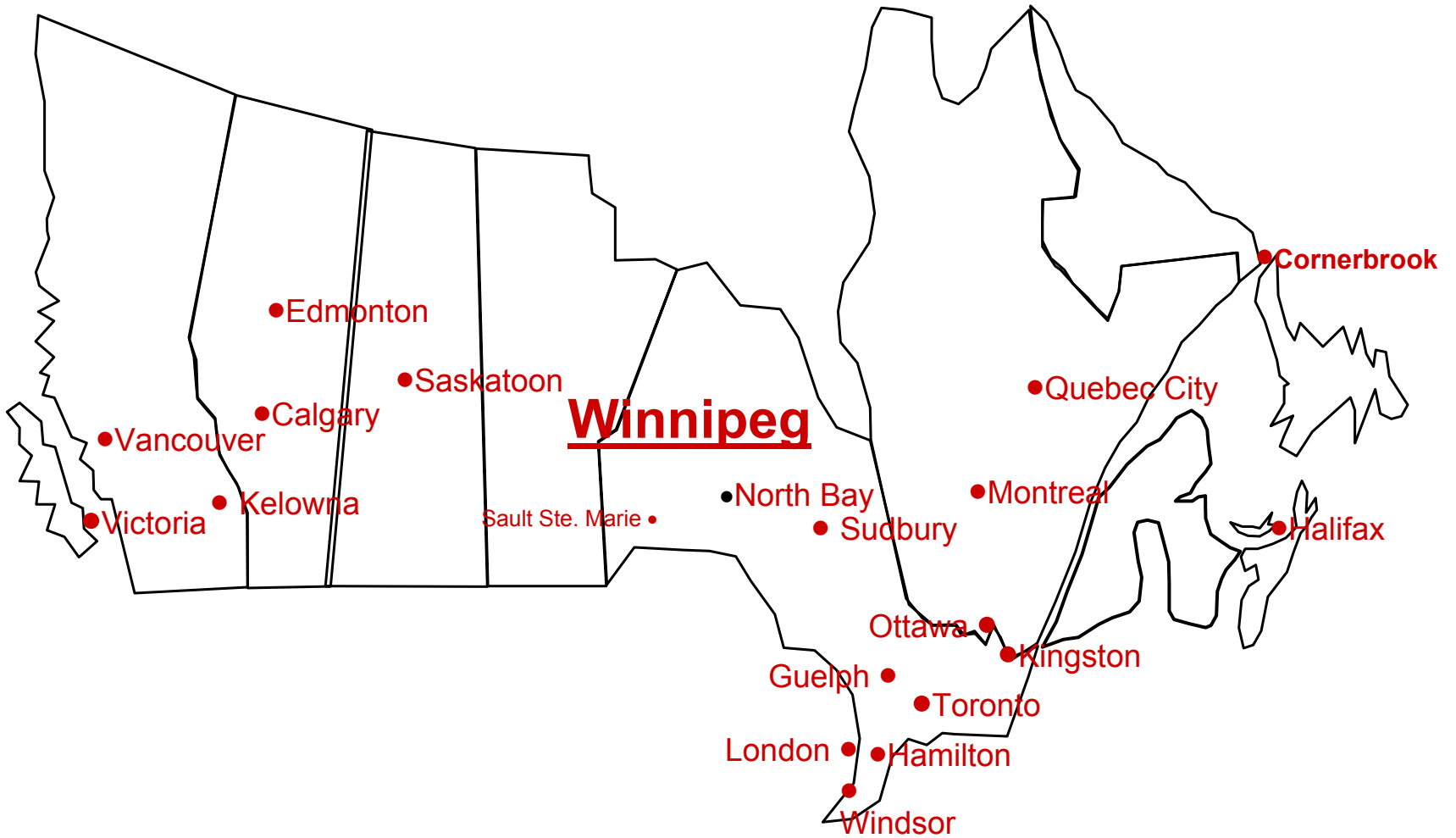
- aPTT cannot be measured quickly, plasma may be transfused in an attempt to stop diffuse nonsurgical bleeding.
Level of evidence: II
- 14** Plasma should be used in the treatment of TTP or adult HUS, followed as soon as possible by daily plasmapheresis with either cryosupernatant or plasma as replacement fluid. Plasma transfusion or exchange is not recommended in the classic form of pediatric HUS.
Level of evidence: I
 - 15** Plasma should be used in patients with acquired deficiencies of a single coagulation factor only when DDAMP or appropriate factor concentrates are ineffective or unavailable. Plasma should be used in these patients only when bleeding has occurred or is reasonably expected to occur from surgery or other invasive procedures. Plasma may be used depending on the specific factor involved.
Level of evidence: III
 - 16** Current, accurate information pertaining to the infectious risks of red blood cells and plasma should be accessible to physicians, other health care providers and consumers.
Level of evidence: N/A
 - 17** Local committees responsible for blood transfusions for an institution or a regional health authority should ensure that accurate information about the infectious risks of blood transfusion are disseminated to health care providers.
Level of evidence: N/A

Levels of Evidence

(The definition of the levels of evidence is a modified version of that used by the Canadian Task Force on the Periodic Health Examination)

- I** Evidence obtained from at least one properly randomized controlled trial.
- II** Evidence obtained from well-designed controlled trials without randomization, cohort or case-control analytic studies, preferably from more than one centre or research or evidence obtained from comparisons between times or places with or without the intervention.
- III** Opinions of respected authorities, based on clinical experience, descriptive studies or reports of expert committees.
- N/A** Not Applicable: opinions of the EWC, regarding issues that cannot be evaluated using accepted study designs.

Blood Conservation Programs



The Medical Post

August 23, 2000 Volume 36 Issue 28

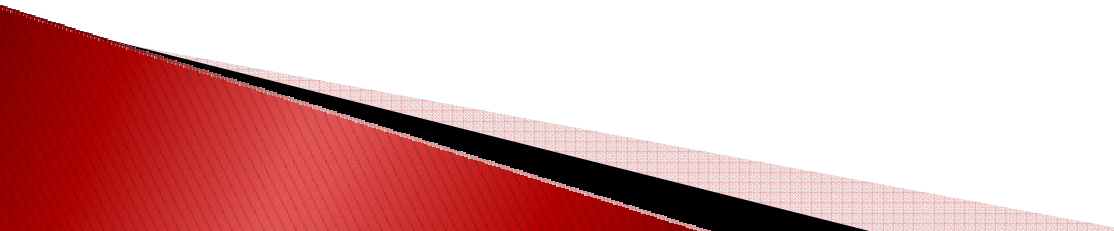


Winnipeg launches bloodless surgery clinic

By Myron Love

WINNIPEG – The Health Sciences Centre here is now home to Canada's first bloodless surgery clinic. The Manitoba Blood Alternatives Program, launched in June, is seen as the first piece of a nationwide bloodless surgery network operating under the aegis of the Anemia Institute for Research and Education

Blood Conservation Program Objectives

- To reduce the rate of blood transfusions through best evidence and practice,
 - To educate patients and health care professionals about Transfusion Medicine initiatives and current evidence.
- 



Bloody Easy Online Programs

For the Physician, Nurse and Technologist:

Blood Transfusions, Blood Alternatives and Transfusion Reactions
A Guide to Transfusion Medicine

For the Patient:

Blood Transfusion: A Patient's Perspective

Registered users can login here:

User Name:

Password:

Login

Bloody Easy News

Online Courses Now FREE!

The Bloody Easy Online Courses are now FREE! Click on the link on the right to launch the Bloody Easy Courses!

Bloody Easy Course Credit

This course has been recognized by the Canadian Society for Medical Laboratory Science, the Royal College of Physicians of Canada and the American Medical Association. [Click here](#) for more information

Free e-Learning Program: For the Physician, Nurse and Technologist



Launch Program

Bloody-Easy is an electronic learning tool providing practical information on transfusion medicine. It is designed to enhance the ability of physicians, nurses and technologists to use blood transfusion and its alternatives knowledgeably. This course will help physicians, nurses and technologists to recognize and manage adverse consequences of transfusion. It will also provide an evaluation and recognition of successful completion of the course.

The course is a complement to the Bloody Easy pocket guide to transfusion and a power-point presentation for use in hospital in-service training.

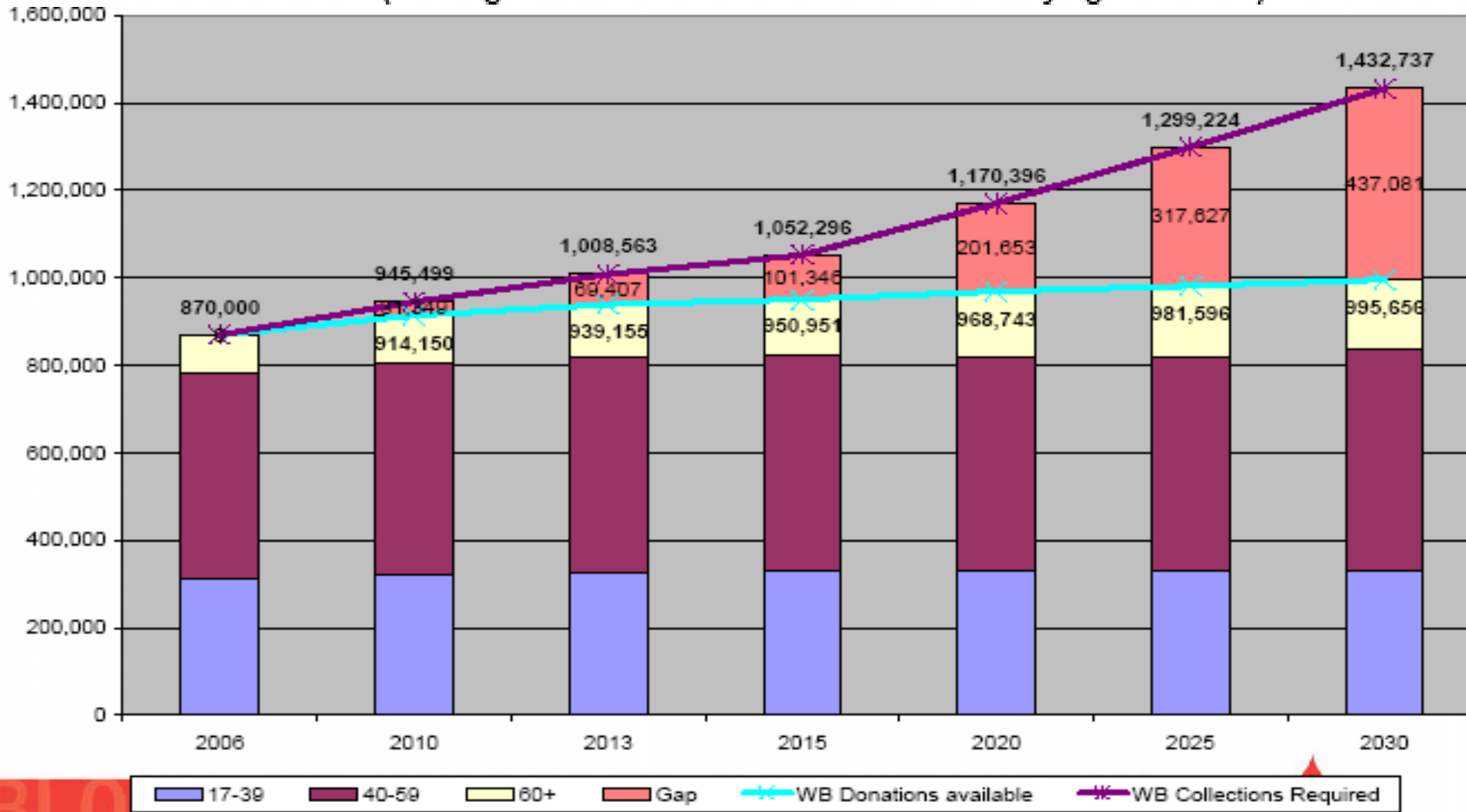
This site and e-learning content is now provided free with the support of the Ontario Ministry of Health Long Term Care. You must still register, at no cost, to gain access to the Bloody Easy program for physicians, nurses and technologists. There is only an academic administration fee of \$20 for those choosing to earn their certificate and apply for CE Credit - a passing grade on the assessments is required.

[Click here](#) for the Minimum Computer Requirements. [Click here](#) to review the Online Course Features. [Click here](#) to review the Course Content Summary. To view some sample pages from each module, [Click Here](#).

As Boomers Age – Potential Demand Grows Exponentially

WB Potential by Age Group vs Donations Required

(holding 2005 donation and utilization rates by age constant)



Why Blood Conservation?

Improve Patient Safety

Risk	Frequency per unit transfused
Minor Allergic reaction (urticaria)	1:100
Febrile Non-hemolytic Reaction	1:300 RBC units
Circulatory Overload (TACO)	1:700 per transfusion episode
Acute Lung Injury (TRALI)	1:5,000
ABO-incompatible transfusion	1:40,000 per RBC transfusion episode
Hepatitis B	1:82,000
HIV	1:4,700,000
Hepatitis C	1:3,100,000
Symptomatic sepsis per unit of RBC	1:100,000
West Nile Virus, vCJD, new pathogens	WNV: 1:1,000,000 Other: unknown
Transfusion Related Immunosuppression	unknown

Map of Blood Conservation Strategies

Devices and techniques that limit iatrogenic blood loss

- Transcutaneous oximeter
- Pulse oximeter
- Microsampling equipment
- Essential tests only
- Multiple tests per sample
- Smaller samples (paediatric-sized tubes)

Volume expanders

- Crystalloids
- Colloids

Therapeutic agents and techniques for managing anaemia

- Stop any bleeding
- Oxygen support
- * Haemoglobin solutions (when available)
- Perfluorocarbon-based oxygen-carriers (when available)
- Maintain intravascular volume
- Haematinics
- Erythropoietin (rHuEPO)
- Nutritional support
- Immunosuppressive agents if indicated
- Hyperbaric oxygen therapy
- Tolerate lower degree of normovolemic anaemia (10/30 rule has no scientific basis)

Surgical and anaesthetic techniques to limit blood loss

- Hypotensive anaesthesia
- Maintenance of normothermia
- Haemodilution
- * Intra-operative cell salvage
- * Post-operative blood salvage
- Laparoscopic surgery (keyhole surgery)
- Reduce blood flow to skin
- Meticulous haemostasis
- Arterial embolisation
- Pre-operative planning
- Cryosurgery
- Minimally invasive surgery

Techniques and devices to control bleeding and shock

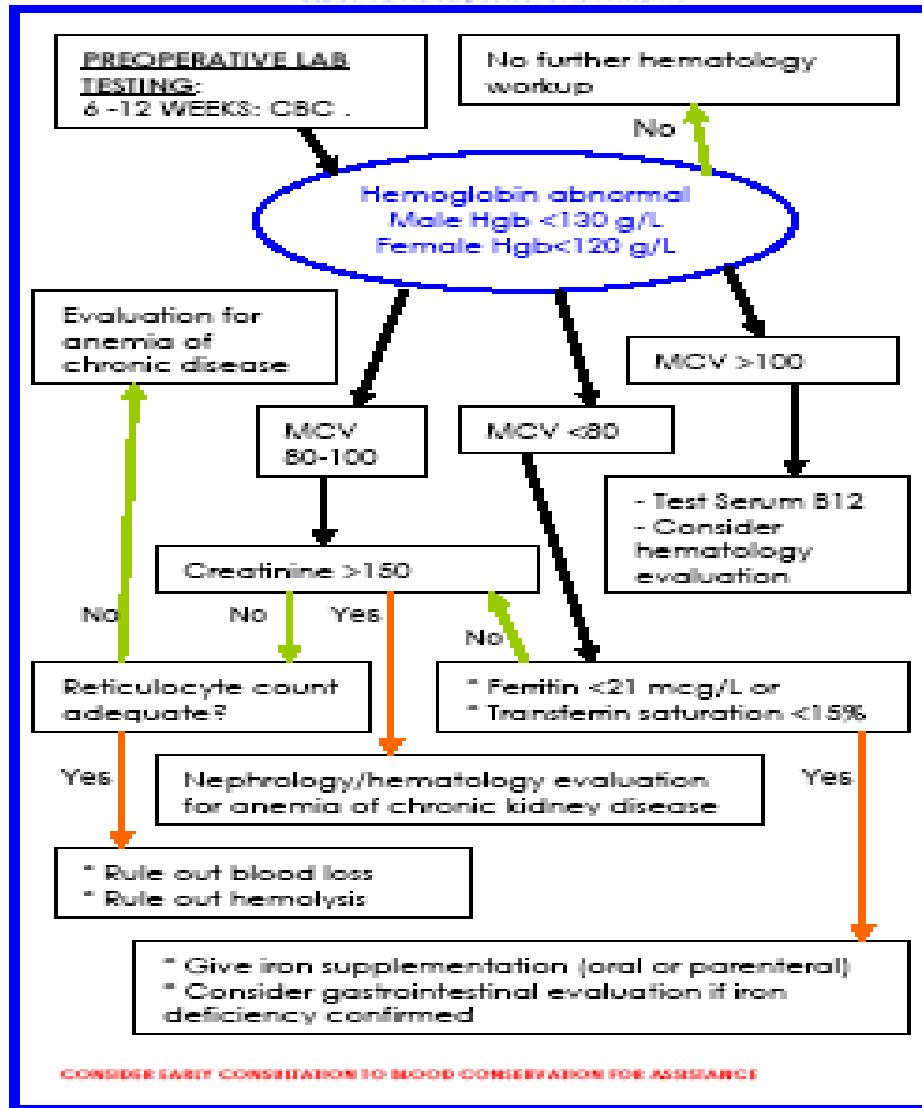
- For bleeding
- For shock

Surgical Devices to minimise blood loss

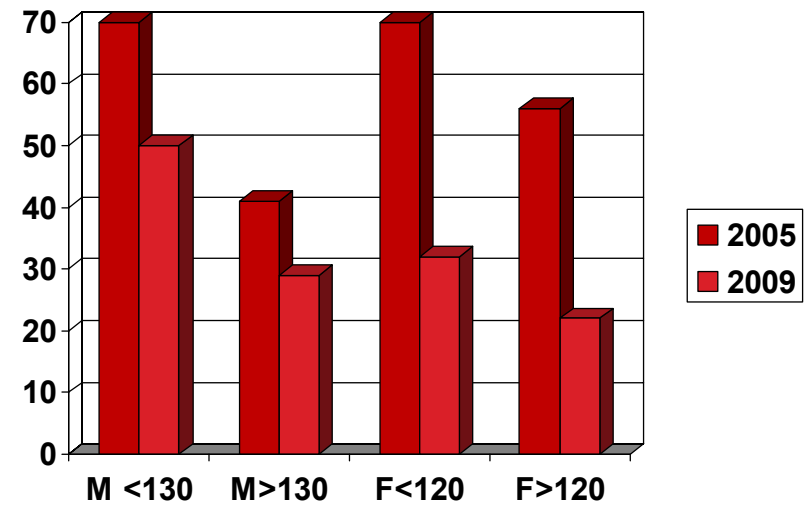
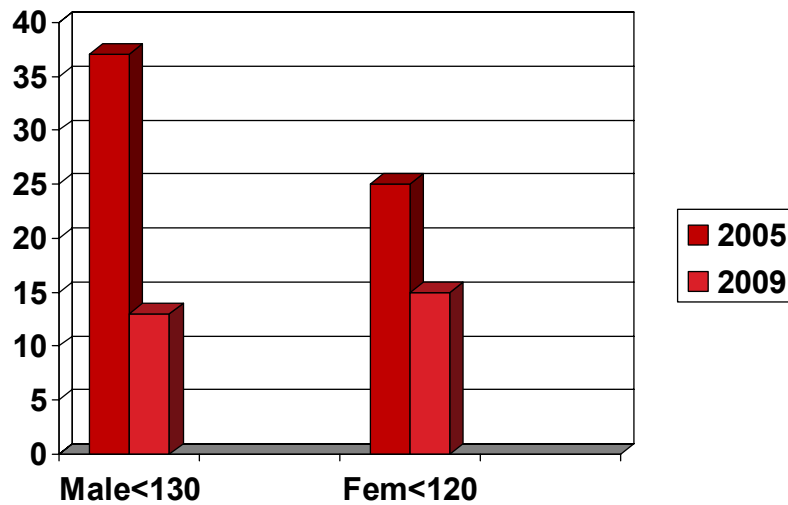
- Electrocautery/Electrosurgery
- Laser surgery
- Argon beam coagulator
- Stereotactic radiosurgery
- Microwave coagulating scalpel
- Ultrasonic scalpel
- Gamma knife radiosurgery

* Confirm acceptability of these modalities with patients who are Jehovah's Witnesses

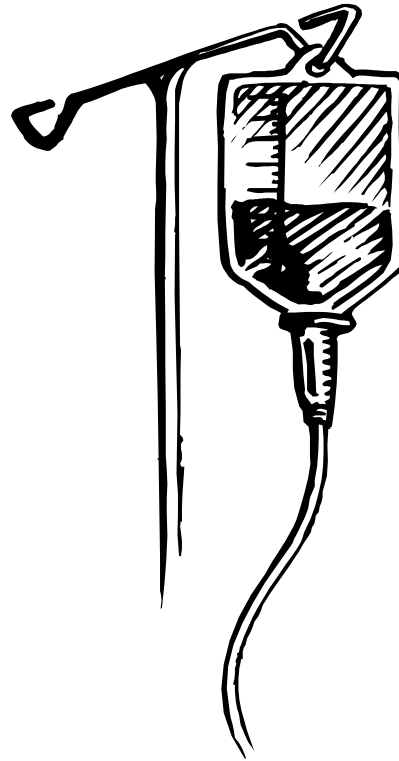
CLINICAL CARE PATHWAY FOR IDENTIFICATION AND EVALUATION OF ANEMIA IN ELECTIVE ADULT SURGICAL PATIENTS



Pre-operative Anemia Algorithm



Parenteral Iron



Parenteral Iron Clinic

- ▶ Run through HSC Pre-Op Clinic since 2000,
- ▶ Restricted to patients with:
 - Absolute iron deficiency with a risk of transfusion
 - Functional iron deficiency with a risk of transfusion
 - Unable to improve iron status with oral and/or dietary iron
- ▶ Products available:
 - Iron Dextran,
 - Iron Sucrose.

Case Study#1

Surgical patient

Surgical Consult

- ▶ Consult received 2 months before surgery

“ 51 year old with heavy periods booked for TAH and BSO. hemoglobin 61 g/L otherwise healthy. Please assess for possible blood transfusion before surgery.”

- ▶ 56 kg female
- ▶ MCV 59 fL
- ▶ Ferritin 3 ug/L

BCS Consult response

- ▶ ***Dx: Iron deficiency Anemia (IDA)***
- ▶ ***NO TRANSFUSION***
- ▶ Parenteral Iron Sucrose: total dose of 1 gram of divided into 4 treatments

TREATMENT

- ▶ Started with a 300 mg dosage of Iron sucrose given over 1.5 hours.
 - Tolerated infusion well,
 - only complaint was of metallic taste in her mouth (like black licorice)
 - That evening complained of severe nausea and vomiting.
- ▶ Patient still wishing to pursue further treatment
- ▶ Allowed to rest and re-hydrate. Iron sucrose 200 mg given 5 days later, no adverse reaction this time; only metallic taste.
- ▶ Continued with remainder of doses

Case 1 Outcome

Time Point	Hb	MCV	Ferritin
Pre- Tx	61	59	3
12 days post first dose of IV Fe (6 wks pre-op)	75	68	
14 days post last dose (4 wks pre-op)	101	69	47
Pre-Op	108	79	

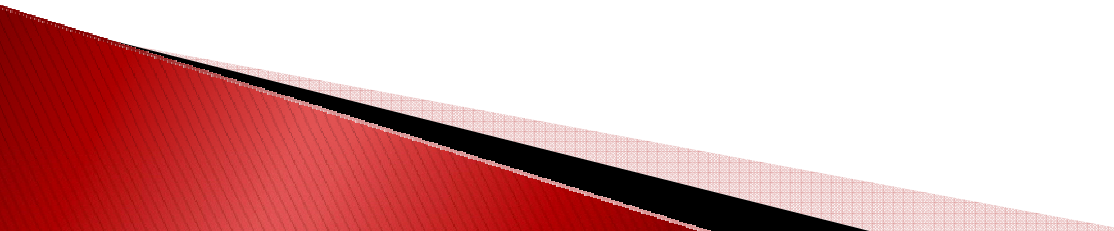
Case Study #2

Obstetrical Case

Obstetrical Consult

- ▶ 30 year old G7P4 23 week pregnant woman
- ▶ Hgb 84 g/L, MCV 68 fL and ferritin 2 ug/L
- ▶ Patient unable to tolerate oral iron
- ▶ Patient was extremely fatigued and had trouble getting out of bed

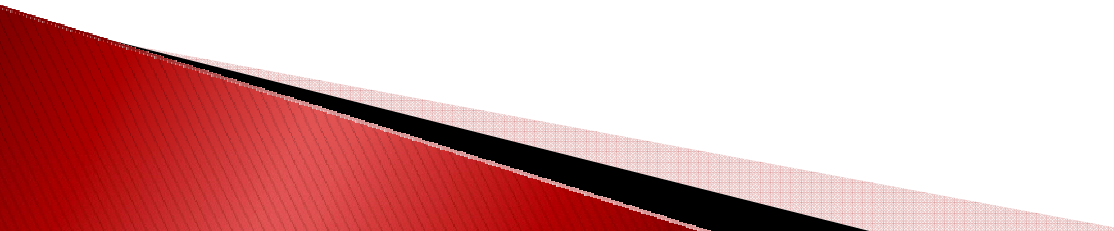
Other pertinent information

- ▶ Thalassemia ruled out.
 - ▶ IDA attributed to frequent heavy menses and multiple pregnancies.
 - ▶ Prior tx with Iron dextran with an adverse reaction
 - ▶ Patients pre pregnant weight was 70 kg
- 

Consult recommendation

- ▶ Total dose of Iron sucrose 750 mg
- ▶ Check ferritin levels three weeks post infusion completion.

TREATMENT

- ▶ No adverse effects from treatment. Subjectively felt like she had much more energy after her second dose.
 - ▶ Recommended treatment completed and blood work drawn three weeks post treatment completion
- 

Re-Assessment

Time Point	Hb	MCV	Ferritin
Pre- Tx	74	68	2
Post 750 mg	92	76	11

- ▶ Recommendation for another 400 mg of iron sucrose

Treatment Continues:

- ▶ By this time this patient was past 34 weeks so the rest of treatment was coordinated thru T 2 at women's hospital

Time Point	Hb	MCV	Ferritin
Pre- Tx	74	68	2
Post 750 mg	92	76	11
Post 1150 mg	100	78	

- ▶ Another 200 mg ordered after these labs for a total of 1350 mg of iron sucrose.

FINAL RESULTS

Time Point	Hb	MCV	Retics	Ferritin
Pre- Tx	74	68		2
Post 750 mg	92	76		11
Post 1150 mg	100	78		
Post 1350 mg	108	78	97H	16

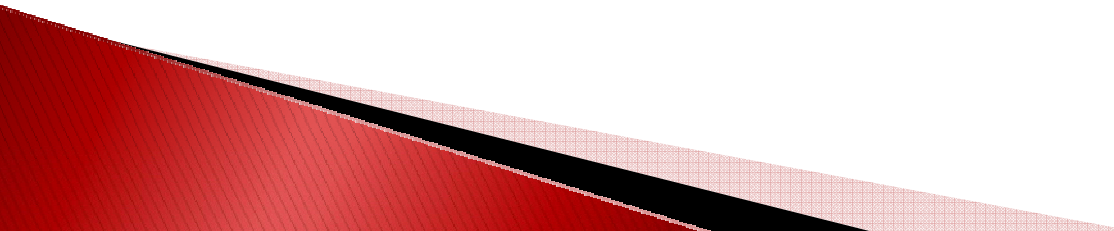
- ▶ Delivery of a >10 pound healthy boy.
- ▶ Hemoglobin 79 g/L post delivery.
- ▶ No transfusions

CASE STUDY #3

Orthopedic Surgery Case

CASE STUDY #3

- ▶ 33 year man with severe RA, asthma and anemia of chronic disease.
 - ▶ hip revision has a transfusion risk of about 60% based on procedure & surgeon.

 - ▶ 64 kg (estimated blood volume of 4.4 litres)
 - ▶ Hb 119 g/L
 - ▶ Increases transfusion risk to 100%
- 

RECOMMENDATIONS

- ▶ PLAN
 - intravenous iron sucrose
 - ESA
 - Pre autologous donation

TREATMENT COURSE

Timing	Tx	Hgb	MCV	Retics	Ferritin
Screening		119	77		109
7 wks pre-op	200 mg IV Fe, ESA 20K IU				
6 wks Pre-op		129	79	63	
5 wks pre-op	2 x 200 mg IV Fe				
4 wks pre-op		134	79	54	
3 wks pre-op	PAD, ESA 40K IU				
2 wks pre-op	PAD, ESA 40K IU	141 (pre-donation)		168	
Morning of Sx		130		178	

OUTCOME

Timing	Comments	Hgb
Pre-Op		130
OR	Acetabular component revision Intra-Op EBL = 1000 mls Cell saver return 220 mls	
Post Op		84
POD1	Transfused 1 PAD unit	66
POD2	Transfused 1 PAD unit	69
POD3		81
POD5		84

Parenteral Iron Summary

Parenteral Iron is a safe & effective treatment for:

- ▶ Absolute iron deficiency
- ▶ Support of PAD with ESA