A Provincial Perioperative Blood Conservation Program

Sophie Stouth RN
ONTraC Blood Conservation Coordinator
Hamilton Health Sciences
Today’s Objectives

- define Blood Conservation
- outline ONTraC’s history, mission, and objectives
- outline Perioperative Blood Conservation strategies
- examine ONTraC outcomes, it’s impact and challenges
In 1997, the Krever Commission Report stated that

“blood components and blood products will never be without risk. The best way to reduce that risk is to reduce their use”.

Despite important advances to reduce transfusion risks, this statement remains true today.
Blood Conservation

Definition:

“Blood Conservation is a global concept engulfing all possible strategies aimed at reducing patients’ exposure to allogeneic blood products.”

Seeber, P. and Shander A. Basics of Blood Management
In 2002, Ontario had the highest rate of red blood cells transfused in all of Canada and the Ministry of Health recognized the need to address blood conservation.

Formed in 2002, OntraC began as a 2 year pilot project.
What is ONTraC

ontario transfusion coordinators
ONTraC stands for Ontario Nurse Transfusion Coordinators.

It is a Provincial Blood Conservation Program supported by the Ontario Ministry of Health and Long Term Care.
The program attempts to enhance transfusion practice by promoting alternatives to allogeneic transfusion in surgical patients, thus improving patient care and well-being in a cost-effective manner.
This multidisciplinary, multifaceted program aims at transfusion practice change involving anaesthesiologists, surgeons, internists, haematologists, nurses, technologists, hospital administrators and patients.
• ONTraC’s mission was to implement a Perioperative Blood Conservation Program in 23 hospitals throughout Ontario.

• The institutions, large and small, were chosen on the basis of blood utilization and geographic distribution.

• The sites chosen were a combination of teaching and community hospitals and represented approximately 65% of blood used in Ontario.
The Good News....

Red cell issues per 1,000 population

- Canada (except ON & QC)
- Ontario


CBS, 2007
The 2 year pilot project was a success. The Ministry of Health measured the positive impact of ONTraC and in 2005, granted ongoing funding until 2009.

The program then underwent an extensive review for renewal and once again was recognized for its positive impact. In 2010, ONTraC was given funding for another 5 years.
Presently in 2013, there are 28 ONTraC Blood Conservation Coordinators covering 24 sites.

Typically, there is one Coordinator per site.

Some sites consist of 2 or more hospitals.
ONTraC: Hospital Sites
ONTraC Sites
2013

- Guelph General Hospital
- Hamilton Health Sciences Centre
- Kingston General Hospital
- Lakeridge Health Corporation, Oshawa
- London Health Sciences Centre
- Niagara Health System
- North Bay Regional Health Centre
- The Ottawa Hospital
- Peterborough Regional Health Centre
- Sault Area Hospitals, Sault Ste. Marie
- St. Mary’s General Hospital, Kitchener
- Health Sciences North, Sudbury
- Hospital for Sick Children, Toronto

- Humber River Regional Hospital
- Mt. Sinai Hospital, Toronto
- Scarborough General Hospital
- St. Joseph’s Health Centre, Toronto
- St. Michael’s Hospital, Toronto
- Sunnybrook Health Sciences Centre, Toronto
- Toronto East General Hospital
- Trillium Health Partners, Mississauga (formerly Credit Valley & Trillium Health Centre)
- University Health Network (Toronto General & Toronto Western Hospitals)
- Windsor Regional Hospital
- Southlake Regional Health Centre, Newmarket
ONTraC’s objectives are:

• to have hospitals develop their own Perioperative Blood Conservation Program
• to avoid allogeneic blood transfusions where possible and when necessary to transfuse, to transfuse as little as possible
• to facilitate the correction of preoperative anemia
• to collect accurate data on transfusion practices to allow benchmarking and evaluation of program success
What is a Perioperative Blood Conservation Program?
The program......

...promotes blood management and blood conservation initiatives in the

- Pre-operative phase
- Intra-operative phase
- Post-operative phase
It is patient blood management by

1. Correcting preoperative anemia
2. Minimizing perioperative blood loss
3. Using minimal Hb-based transfusion triggers
4. Including the use of autologous blood

- Correction of anaemia
  - Iron, $B_{12}$, folic acid, rHuEpo
- Blood conservation programme
- Reduction of blood loss
  - Tranexamic acid, sealants and glues, rFVIIa, ...
- Autologous blood
  - Preoperative autologous donation
  - Normovolaemic haemodilution
  - Perioperative cell salvage

$Hb < 70–80 \text{ g/l}$

Restrictive transfusion protocol
How is this done?
Perioperative Blood Conservation Strategies

Preoperative

• algorithm guidelines
• identify those patients who are at risk of having a blood transfusion
• screen to identify patients with a sub optimal hgb
• offer patient education regarding options and strategies
It is important that the Coordinator sees patients early enough (preferably at least 3-4 weeks pre-op)...

- to identify those patients at risk of transfusion prior to surgery
- to allow for the detection and correction of anemia
- and time to develop of an appropriate blood conservation plan.

BUT...

this is not always possible.
Algorithm for Preoperative Hemoglobin Optimization and Anemia Management for the Perioperative Blood Conservation Program

**Goals:**
1. To increase awareness and availability of transfusion alternatives.
2. To identify preoperative anemia for appropriate treatment by physician.
3. To decrease patient’s exposure to the risks of allogeneic transfusion.
4. To enhance postoperative rehabilitation and potentially decrease infection rates and length of stay.

**Strategies:**
1. Early assessment of patients undergoing surgical procedures associated with >10% blood loss.
2. Early identification of Risk Factors for Transfusion: Hemoglobin <130, weight <65 kg, elderly, female gender, complex or repeat surgical procedure, renal insufficiency (creatinine clearance < 40), pharmaceuticals (ASA, anticoagulants, herbs, vitamins).
3. Assess for appropriate interventions and arrange for implementation.

![Algorithm Diagram](image)

**Hemoglobin Categories:**
- **HGB <100 g/L**
  - Consider delaying procedure. Refer to appropriate physician for investigation.
- **HGB 100 – 130 g/L**
  - Evaluate for blood loss – GI, menstrual, recurrent epistaxis
  - Evaluate anticoagulant status
  - Look for signs of renal / hepatic failure (treat underlying cause)
  - Check: CBC, including indices, reticulocyte count.
- **HGB >130 – 150 g/L**
  - Consider iron, folate, B12 +/- autologous pre-donation plus Erythropoietin support as needed.
- **HGB >150 g/L**
  - Consider needs of surgical procedure.

**Microcytic (MCV <80):**
- Consider: iron deficiency, Thalassemia, anemia of chronic disease, Sideroblastic anemia, renal failure
- Consider: Appropriate Medical Consult and Lab Investigation as per Physicians Orders

**Normocytic (MCV 80-100):**
- Consider: Chronic disease, cancer, inflammation, marrow problem, hemolysis, bleeding, sequestration, renal failure.
- Consider: Appropriate Medical Consult and Lab Investigation as per Physicians Orders

**Macrocytic (MCV >100):**
- Consider: alcoholism, hypothyroidism, hepatic disease, medications: HIV antiviral, Hydrea®, Sepra®, Methotrexate®, myelodyplasia (cytopenias), reticulocytosis
- Consider: Appropriate Medical Consult and Lab Investigations as per Physicians Orders

**Check:**
- Serum Ferritin
- TIBC & iron saturation. *False elevations in Ferritin may occur with inflammation, e.g. rheumatoid arthritis, lupus, sepsis, inflammatory bowel disease.

**TIBC: Ferritin Levels:**
- TIBC <45 mcmol/L, Ferritin >100 mcg/L: Anemia of chronic disease
- TIBC 45–72 mcmol/L, Ferritin 15-100 mcg/L: Suspect iron deficiency
- TIBC >72 mcmol/L, Ferritin <15 mcg/L: Iron deficiency

**Erythropoietin: Standard Dosing:**
- Eprex® 20,000 – 40,000 units subcutaneously (600 units/kg) weekly to a maximum of 4 doses depending on presenting hemoglobin and time to surgery.

**NOTE:** Hemoglobin optimization and anemia management strategies must be patient specific (e.g. age, gender, and pre-existing medical conditions). CAUTION: Target maximum HGB optimization using erythropoietin in renal and oncology patients to <120g/L. Patients with pre-existing thrombotic events should be monitored closely.

[www.ontracprogram.com](http://www.ontracprogram.com)

Developed by Ontario Transfusion Coordinators (ONTraC), a blood conservation initiative by the Ministry of Health and Long Term Care of Ontario (MOHLTC) – February 2007
Preoperative Strategy

Iron Therapy

- Hgb <130 g/L
- Iron rich diet – patient information pamphlets are available
- Oral iron supplements (must be approved by physician)

"Take two pills, three times daily. Use force if necessary."
Preoperative Strategy

Autologous Donation

- Hgb > 130 g/L
- must be referred to CBS by physician
- patient must meet medical criteria
- oral iron prescribed
- donated blood has a shelf life so must be obtained close to surgery date
Preoperative Strategy

**Erythropoietin therapy**

- hgb <120 g/L
- patient must meet medical criteria
- physician must prescribe
- very expensive and not always covered by insurance
- if over 65 yrs or Jehovah’s Witness, may request coverage through the Ministry of Health’s Exceptional Acceptance Program
- usually requires 2-3 injections, a week apart just prior to surgery
- must take oral iron for effect
Perioperative Blood Conservation Strategies

**Intraoperative**
- Surgical technique
- Minimally invasive technology
Intraoperative haemostasis:
use of cautery, oxycel, tisseel and tranexamic acid
Perioperative Blood Conservation Strategies

**Intraoperative**

Acute Normovolemic Hemodilution (ANH)

- removal of patient’s blood before surgery either before or shortly after induction of anaesthesia
- volume replaced with crystalloid or colloid fluids
- reduces the amount of red cells lost during surgery by decreasing the red cell mass just prior to surgery
- no wastage as all units are re-transfused usually prior to the patient leaving the OR
Perioperative Blood Conservation Strategies

Intraoperative

Cell Salvage

• patient’s blood is suctioned, washed, filtered and returned
• often accepted by Jehovah Witness patients
Perioperative Blood Conservation Strategies

Postoperative

• knowledge of and compliance to established transfusion protocols and algorithms – treat the patient, not the number
• if required, transfuse one unit and reassess before transfusing a second
• minimal blood sampling protocol
• pharmaceutical agents
Most patients transfused for lab diagnosed anemia, not symptoms

Data Collection
ONTraC presently collects data on four targeted surgeries that represent the highest rate of Red Blood Cell (RBC) transfusion.

They are:

- Total Knee Replacement
- Total Hip Replacement
- Primary CABG (Coronary Artery Bypass Grafts)
- Radical Prostatectomy
Data is collected annually from each site to monitor trends indicating the individual program’s effectiveness.

Aggregate data is also provided to show how each site compares to the provincial standing.
Reduction in transfusion rates since onset

Proportion of patients transfused with allogeneic blood

<table>
<thead>
<tr>
<th></th>
<th>Per Txed pt</th>
<th>Per pt overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline 2012</td>
<td>2.1</td>
<td>0.51</td>
</tr>
<tr>
<td>Baseline 2012</td>
<td>1.9</td>
<td>0.10</td>
</tr>
<tr>
<td>KNEE</td>
<td>3.3</td>
<td>2.01</td>
</tr>
<tr>
<td>CABG</td>
<td>2.5</td>
<td>0.70</td>
</tr>
</tbody>
</table>
Reduction in transfusion rates (RBC) since onset of data collection - 2012

<table>
<thead>
<tr>
<th>Procedure</th>
<th>% decrease from baseline</th>
<th>Time period</th>
</tr>
</thead>
<tbody>
<tr>
<td>CABG</td>
<td>55.5%</td>
<td>2002 – 2012</td>
</tr>
<tr>
<td>Knee</td>
<td>73.1%</td>
<td>2002 – 2012</td>
</tr>
<tr>
<td>Prostate</td>
<td>54.4%</td>
<td>2005 – 2012</td>
</tr>
<tr>
<td>Hip</td>
<td>61.5%</td>
<td>2007 – 2012</td>
</tr>
</tbody>
</table>
**Effect of having a long lead time to optimize preoperative treatment of anemia (2012)**

<table>
<thead>
<tr>
<th>Lead Time</th>
<th>1 Knee</th>
<th>1 Hip</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 7 days</td>
<td>9.9 %</td>
<td>14.8 %</td>
</tr>
<tr>
<td>7-14 days</td>
<td>8.2 %</td>
<td>11.2 %</td>
</tr>
<tr>
<td>15-21 days</td>
<td>7.5 %</td>
<td>10.1 %</td>
</tr>
<tr>
<td>&gt; 21 days</td>
<td>4.9 %</td>
<td>9.4 %</td>
</tr>
<tr>
<td>P (ANOVA)</td>
<td>&lt;0.0001</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

**Lead Time prior to surgery:**
- CABG pts had short lead times: only 35% had lead time > 14 days
- 1 Knee pts: 65% had lead time > 14 days
## Effect of pre-operative Hb level

<table>
<thead>
<tr>
<th>Pre-op Hb</th>
<th>Percent transfused</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Knee</td>
</tr>
<tr>
<td>Hb &lt; 130 g/L</td>
<td>26.0%</td>
</tr>
<tr>
<td>Hb &gt; 130 g/L</td>
<td>6.1%</td>
</tr>
<tr>
<td>Hb &gt; 140 g/L</td>
<td>3.7%</td>
</tr>
</tbody>
</table>

Pre-op Hb of 100 g/L has a seven-fold higher likelihood of transfusion than Hb 130 g/L
<table>
<thead>
<tr>
<th></th>
<th>LOS (days ± SD)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Not Transfused</td>
<td>Transfused</td>
</tr>
<tr>
<td>1 Knee</td>
<td>4.2 ± 2.1</td>
<td>7.7 ± 5.5</td>
</tr>
<tr>
<td>1 Hip</td>
<td>4.3 ± 4.0</td>
<td>6.4 ± 4.4</td>
</tr>
<tr>
<td>CABG</td>
<td>6.6 ± 3.5</td>
<td>8.3 ± 4.9</td>
</tr>
<tr>
<td>RP</td>
<td>2.7 ± 1.3</td>
<td>5.0 ± 3.2</td>
</tr>
</tbody>
</table>
Percent of hospitals meeting the benchmark

CABG – below the benchmark (arbitrary ≤ 30%)
Knee – below the benchmark (arbitrary < 12.5%)

CABG
- Transfusion Rate
- Meets Benchmark (% of hospitals)

Knee
- Transfusion Rate
- Meets Benchmark (% of hospitals)
Review article: Risks of anemia and related management strategies: can perioperative blood management improve patient safety?

Gregory M. T. Hare, MD, PhD · John Freedman, MD · C. David Mazer, MD
The usual equation

RISK

BENEFIT
Risk Vs. Benefit is in the Eyes of the Beholder

BUT, known risks should outweigh perceived benefits every time.
We need to ask:

• Does your patient need blood?
• When should you transfuse?
• How can you avoid transfusion?
• What are the benefits to the patient by avoiding transfusion?
• What are the benefits to the system by avoiding transfusion?
While blood transfusion can be life-saving, it is evident that many administered transfusions are unnecessary or inappropriate.

Increasing literature shows that blood transfusions may be associated with increased patient morbidity, mortality, length of stay, increased costs and potential blood shortages.
Myth Buster: Blood is not “FREE”
What is the cost of transfusion?

Direct cost
   Product; tubing; supplies, etc

Indirect cost
   Labour, outcomes, etc
      Lab (grouping, viral testing, etc)
      Blood Bank (grouping, cross matching, etc)
      Clerical; Nursing

SABM study recently estimated total cost to be $1400/unit

Challenges of the Program
Difficulties & Pitfalls

- Emphasis on shorter wait times for surgery
- Costs and access to some blood conservation measures
- Turnover of coordinators, physicians, administrators result in a reversal of gains
- Can be quite difficult to recruit physician & administrative champions
- Perceived in some hospitals as a ‘big city’ initiative/ is academically driven/ and attempts to dictate practice
In Summary
Patient Blood Management: Aims

- Allogeneic transfusion avoidance
- Transfusion reduction

Blood transfusion is inherently hazardous and costly and should only be prescribed when there is evidence that patient benefit would outweigh the potential for harm.
Restrictive transfusion protocol

Correction of anaemia
- Iron, B_{12}, folic acid, rHuEpo

Reduction of blood loss
- Tranexamic acid, sealants and glues, rFVIIa, ...

Autologous blood
- Preoperative autologous donation
- Normovolaemic haemodilution
- Perioperative cell salvage
• Cardinal to success is a local champion - a well-respected physician who will work closely with the Coordinator in developing new procedures/protocols and presenting them to the staff.

• Need to develop algorithms & pamphlets relevant for their institution; tailor to institution realities as much as possible; not “one size fits all”
Lessons Learned

To change practice, one needs data on current transfusion rates & practices – ‘buy-in’ is achieved by sharing comparative data - no-one likes to be worse

“I think you’ll find that mine is bigger...”
The **success** of any Blood Conservation Program requires a multidisciplinary approach to the patient throughout the entire perioperative period.
Bloodless medicine (or blood conservation) requires coordination of services across a variety of departments....cooperation between outpatient scheduling, surgical and anesthesia physicians and their clinic personnel, operating room scheduling, intensivists and hematologists to get the patient prepared, ...the billing office....

This is in contrast to a transfusion, which can usually be accomplished with one phone call....

from T Kickler, Johns Hopkins, Transfusion 43:550, May 2003]
Welcome

ONTraC
Ontario Nurse Transfusion Coordinators
Provincial Blood Conservation Program

The ONTraC program wishes to acknowledge the support of the Ministry of Health and Long-Term Care.

Blood transfusion is a lot like marriage. It should not be entered into lightly, unadvisedly or wantonly, or more often than is absolutely necessary.

“Blood transfusion is a lot like marriage. It should not be entered into lightly, unadvisedly or wantonly, or more often than is absolutely necessary.”

Beal, RW, 1976
Thank you
QUESTIONS?