Preparing for Patients at High Risk of Transfusion

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Ashford Hospital, South Australia
The impact that perfusionists have on the pre-operative period to bypass... to reduce likelihood of transfusion.

Elective Routine Procedure
Elective Routine Procedure

- Walk in at 7am.
Elective Routine procedure

- Walk in at 7am..
  - Often admission previous day
    - May be no prior clinical work up/ bloods taken
    - Late referral/ inter hospital transfer

- Obtain patient details and pathology results
  - Anaemic - Males <13 g/dl, females < 12g/dl (WHO definitions)
    - Patient presenting to the OR approx. 30% * of our cardiac surgery patients
  - INR, APPT, Platelet concentrations, height and weight

* ANZCPR perfusion registry data
Elective Routine procedure

- Incorporate hemodilution minimizing techniques

Cardiopulmonary bypass a major factor in hemodilution

**AmSECT Standards and Guidelines  Standard 13: Blood Management**

- **Standard 13.1:** The Perfusionist shall participate in efforts to minimize hemodilution and avoid unnecessary blood transfusions.
- **Standard 13.2:** The Perfusionist shall minimize the cardiopulmonary bypass (CPB) circuit size to reduce prime volume.
- **Standard 13.3:** The Perfusionist shall calculate and communicate to the surgical team prior to initiating CPB, a patient's predicted post-dilutional hemoglobin or hematocrit.

“Tool Box” approach – what we have available to us.

- Elective Routine procedure
  - Acute
    - Normovolemic
    - Hemodilution
    - Pharmacological agents (minimize blood loss)
      - Tranexamic acid
      - E-aminocaproic acid
  - Circuit/oxygenator
    - Circuit sizing (tubing, oxygenator)/MiECC
    - Bio passive circuits
  - Cannulation
    - Smaller cannula, small A-V loops, VAVD
  - Autologous priming
    - RAP, VAP
  - Cell salvage
“Tool Box” approach – what we have available to us.
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- Acute Normovolemic Hemodilution
- Euvolemic anesthetic technique
- Pharmacological agents
  - Tranexamic acid
  - E-aminocaproic acid

- Circuit sizing
  - Tubing
  - Circuit setting
  - MECC
  - Bio-passive circuits

- Blood loss management
  - Trancxamic acid
  - Cell salvage
  - Ultra filtration
**“Tool Box” approach – what we have available to us.**

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**Autologous priming**

**RAP, VAP**
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- Ultrafiltration
- Anticoagulation management

- Blood loss management
- Circuit sizing
- MI-ECC
- Small A-V loops

- Point of Care Coagulation
- Hematologic Monitoring
- TEG, Rotem
Elective Routine procedure

- Predict on bypass Hb/Hct
  - May need to order blood/ blood products – hospital protocol
    - Historically - Blood transfusion treatment for anaemia
      - Increasing complexity and length of our procedures, and increasing # of reoperations
        - Up to 50 %* of our patients get a transfusion
    - Treat all patients as a “Jehovah Witness” = no blood
      - Not always possible.


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Go have a coffee while we wait for the operation to start

Complex procedures (non emergency)

High risk, complicated or rare procedure.

- Work up by the Team - much greater preoperatively
- Appropriate equipment – surgical and perfusion
- Appropriate monitoring and point of care testing.
- Staffing

- If Anaemia detected – haematological advice
  - Delay surgery
  - Iron supplementation oral or IV
  - ESA - erythropoiesis stimulating agents
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Usually prior to the day of surgery, everything is planned, mapped out with nursing, anaesthesia, perfusion and surgeons all collaborating in what will happen.

Shouldn’t all elective patients deserve that same work up, to maximize their optimal care, minimize anaemia preoperatively?

90%* of intraoperative transfusions given for actual or predicted low Hb

Both anaemia and red cell transfusion are independent risk factors in major surgery.

- **Anaemia** increased complications
  - ↑ ICU and hospital stay
  - ↑ Renal failure
  - ↑ Mortality

- **Red cell transfusion** – high cost and limited supply
  - ↑ ICU and hospital stay
  - ↑ Infection rate
  - ↑ Multi organ failure
  - ↑ Renal failure
  - ↑ Mortality


**Patient Blood Management (PBM) Strategy promoted by the Australian National Blood Authority**

1. Preoperative haemoglobin (Hb) optimization,
2. Intraoperative minimization of blood loss, and

Preoperative tests
• Full blood count
• Iron studies including ferritin
• CRP and renal function

Is the patient anaemic?
Hb <130 g/L (male)
or Hb <120 g/L (female)

NO
Ferritin <30 mcg/L
Ferritin 30–100 mcg/L
Ferritin >100 mcg/L

YES
No anaemia:
ferritin <100 mcg/L
Iron deficiency anaemia
Possible iron deficiency
Possible anaemia of chronic disease or inflammation, or other cause

CRP
Raised
Normal

A template for patients undergoing procedures with anticipated substantial blood loss such as cardiac surgery. Editable electronic version at www.nba.gov.au

A guide to treat our patients
Emphasis on diagnose and treat

Variables Affecting Application of Patient Blood Management in cardiac surgery

- Time of procedure
- Knowledge of PBM
- Resources
- Personnel
- Culture
- Physician Support
- Perceived Value
Andrew 53 yr Male

- Robotic hernia operation
- Day surgery, quick
- Low risk of blood loss

Bloods taken
Bloods repeated 30 mins later
Andrew 53 yr Male

- Robotic hernia operation
- Day surgery, quick
- Low risk of blood loss

- Bloods taken
- Bloods repeated 30 mins later
  - Hb 6gdl
  - "serious" operation cancelled

- Further GI / investigation
- Iron infusion
  - Hb monitored
- Operation rescheduled
ARS Question

In your practice, if a patient is admitted to hospital for routine surgery, and were anaemic on day of surgery, how often would they be cancelled?

1. All the time
2. Occasionally
3. Never
So how do we as perfusionists, make a difference?

AmSECT Standards and Guidelines  Standard 13: Blood Management
Guideline 13.1: Blood management efforts should include the following:

Participate in pre-operative briefings (discussions) with the surgical care team (Standard 5.1) regarding transfusion strategies and target haematocrit values.

Participation in a multidisciplinary blood management team.

“All well a good”…..
So how do we as perfusionists, make a difference?

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“All well a good”….. But we cant all practice that way !!
Elective Routine procedure

- Walk in at 7 am
- Patient details - ANEMIA
- Get out the "tool box"
- Order blood if necessary

do the best we can

Elective Routine procedure

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REACTIVE
do the best we can
Complex procedure

- Weeks prior: Anaemia detected
- Treated
- “tool box” Pre planned
- Order blood if necessary

Optimized patient care
• N=342 patients elective and sub acute cardiac surgery patients

• Anaemia* was present before hospital admission in 59 (24.2%) of elective and 29 (29.6%) of subacute cases (25.7% overall).

• 42.6% transfusion rate
  “was strongly associated with preoperative anemia and renal impairment and low BMI”

• Anaemic patients (81.3%) the diagnosis for surgery was made over 2 weeks prior
  making anaemia a “modifiable risk factor”

ANZCPR data (Australian and New Zealand cardiac perfusion registry)

Over 28,000 patients, 9 sites, since 2007

30% patients anaemic
50-90% elective operations
Primary Aim: To determine whether a single dose of IV iron, given to anaemic patients before elective cardiac surgery improves outcome after surgery.
Primary Endpoint: Days alive and out of hospital from surgery to 30 days following operation
Secondary Endpoints: Includes blood transfusions, perioperative complications, hospital stay, survival, quality of life and disability-free survival.
Aim 2: To demonstrate that IV iron is cost-effective in this setting.
Aim 3: To identify biomarkers that predict iron-responsiveness in the preoperative setting, and to better understand mechanisms of functional iron deficiency in surgical patients with heart disease.

Paul Myles, Director, Department of Anaesthesia and Perioperative Medicine, Alfred Hospital and Monash University, Victoria, Australia
Toby Richards, Professor of Surgery, University College London and Consultant vascular surgeon, University College Hospital and Royal Free Hospitals, London, UK

ITACS trial

- Perfusion directed change...
  - All patients sent letters requesting blood results prior time of 1st consult
  - Nurse practitioner involvement
    - Consider which pathway for the ITACS trial
      - Iron transfusion
      - Placebo
  All patients benefiting – if not enrolled, anemia is flagged, and investigations can occur.

Perfusion Participation in a multidisciplinary blood management team.
Perfusion directed change…

Perfusion Participation in a multidisciplinary blood management team.

“Plan” to deal with anaemia pre operatively.

- Large hospital
  - Pre-op clinics can flag this
    - Bloods taken – results asap

- Smaller hospital
  - Less infrastructure, no pre-op clinics
  - Someone need to “own” it
    - When bloods are taken?
    - Who looks at the results?
    - Who follows up? organises treatment?
Perfusion directed change…

Perfusion Participation in a multidisciplinary blood management team.

- Ward rounds
  - Perfusionist become part of the “team”, clinical staff are aware of us.
  - We have a voice, maybe be the patient advocate
  - Initially may have no impact, hopefully in the future it will have

- Not possible where I work!
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- *Not* Maybe possible where I work!
  - See patients preoperatively
  - Visit the wards
    - physicians, surgeons, patient liaison nurses

Small community hospital

- Perfusionists = 2 (sometimes)
- 1 theatre, 2 HLM
- Work load 1-4 cases per day
  - 7 surgeons
  - Admissions 1 day prior / little pre op info
  - Try to see patients pre operatively
  - Pre set up and prime pumps.
Measurement

Electronic data
- DMS (Stockert) 2005 → CONNECT (Sorin) 2017
- Part of collaborative ANZCP database since its development
- 2014 – multi changes to reduce hemodilution
  - Smaller circuits, RAP, cell salvage, pre volume loading
Measurement

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Perfusion directed change…

**Plan** – Try to further reduce hemodilution – anaemia

- 60% patient need a big oxygenator
- 40 % small oxygenator would be beneficial

Inform the ward of our project

- Obtain bloods earlier
- ASAP on admission.
  - “flag anaemia”
- Discuss with the surgeon, or anesthetist prior to day of surgery
- Obtain patient details earlier Ht & Wt
- Selectively use smaller oxygenators
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Interested in what we are doing and why.

Started Flagging anaemia in the notes.
Perfusion directed change…

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↑ multi disciplinary involvement

Measurement

Can we increase Hb on cpb further?

- RAP the venous line to reduce hemodilution
- Change surgical preference
  - RAP, cell salvage, smaller A-V loops and cannulas (individual surgeon data)
Measurement

Perfusion registries

- ANZCPR and Perform
  - Share the data of anaemia, transfusion rates, outcomes
  - What we do makes a difference.

As perfusionists we can choose to actively participate in the patient’s cardiac surgical journey and help reduce the morbidity associated with transfusion at every opportunity available to us.
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Clinically we will always do what is best for our patients, however the earlier we get involved the more we can achieve.

- 2, 3, 4, 6, 7, 8, 18, 20, 23, 24, 25, 27, 28, 32, 33, 34, 35, 37, 39, 41, 42, 43, 44, 45, 46, 48, 49, 53, 54, 56, 57, 58, 61