Patient Blood Management

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Blood Supply Safety and Availability

- Safety
  - Zero risk
- Resources
- Supply
  - Meet Needs
- Science
- Evidence-based decision making
- Patient blood management
- Haemovigilance
- Cost-benefit analysis
- Quality Management
- Regulation
- Voluntary blood donation reached 94.23% of total collection in 2013.
- VN have been making effort to reach 100% non-remunerated blood donation in coming years.

**Blood Collection (Malaysia) 1995 - 2013**

**Vietnam**

**Blood collection from 1994 to 2013**

**China**

Fig. 2. Increase in blood donations between 2006 and 2011.
Red Cell Transfusions to Resident Patients by Age Distribution based on Population Rates (2009-2013)
Risks of major TTVs linked to interventions, and accelerating rate of EIDs of concern to blood safety

Risk per Unit

Singapore Residual Risk

HIV 1:1,100,000
HBV 1:110,000
HCV 1:1,300,000

Emerging Infectious Disease Threats

Cumulative data for SHOT categories 1996/7–2013 (n=13,141)

- Unclassifiable complications of transfusion
- Post-transfusion purpura
- Transfusion-transmitted infection
- Transfusion-associated dyspnoea
- Autologous
- Acute transfusion reaction
- Transfusion-associated graft vs host disease
- Alloimmunisation
- Transfusion-associated circulatory overload
- Transfusion-related acute lung injury
- Haemolytic transfusion reaction
- Avoidable, delayed or undertransfusion
- Anti-D immunoglobulin
- Handling and storage errors
- Incorrect blood component transfused

Pathological reactions which may not be preventable

Probable or possibly preventable by improved practice and monitoring

Adverse events caused by error
Transfusions potentially expose patients to other risks besides TTIs & Adverse Transfusion Reactions

Blood transfusion increases the risks for:

- Pneumonia
- ICU stay
- Ventilator Time
- Hospital acquired infections
- Mortality

Sustainability of Current Blood Safety Paradigms

- Socio-political concerns include scarcity of health resources and opportunity cost
- Sustainability of current paradigm is questionable
Appropriate Transfusion Practice

• Current transfusion practices are oftentimes subjective and unscientific
• Inappropriate transfusion accounts for more than 20% of all blood transfusions in general and as high as 35-40% of all blood transfusions in critical care (ICU) patients
• Even amongst the “clinically appropriate transfusions”, only about 20% can be proven to be of clear clinical benefit

Appropriateness of allogeneic red blood cell transfusion: The international consensus conference on transfusion outcomes

Volume 25, Issue 3, July 2011, Pages 232-246.e53

Aryeh S. Shander | Arlene S. Fink | Mazyar Javidroozi | Jochen Erhard | Shannon L. Farmer | Howard L. Corwin | Lawrence Tim Goodnough | Axel O. Hofmann | James P. Isbister | Sherri Ozawa | Donat Rudolf Spahn

During the International Consensus Conference on Transfusion Outcomes in 2011, the international multidisciplinary panel of 15 experts reviewed 494 published articles and used the RAND/UCLA Appropriateness Method to determine the appropriateness of allogeneic red blood cell (RBC) transfusion based on its expected impact on outcomes of stable non-bleeding patients in 450 typical inpatient medical, surgical, or trauma scenarios.

Panelists rated allogeneic RBC transfusion as appropriate in 53 of the scenarios (11.8%), inappropriate in 267 (59.3%), and uncertain in 130 (28.9%).
USA

NATIONAL STATS

11% of all hospital stays with a procedure included a transfusion

Blood transfusion is the most common procedure performed during hospitalizations

Average consumption: red cell 10-30K units per facility

Nearly 14 million allogeneic red cell units transfused per year at a direct cost to hospitals of over $3 billion (average red cell $225/unit)

59% of RBC transfusions were found inappropriate

Sources:
Blood transfusion safety is a shared responsibility and a collaborative process within entire “vein to vein” blood system.
Good Clinical Practices to Ensure Safe and Appropriate Blood Transfusion

- Prevention, early diagnosis and effective treatment of conditions that could result in need for transfusion
- Use of good surgical/anaesthetic techniques, pharmaceuticals/medical devices to reduce blood loss
- Consider use of suitable alternatives
- Appropriate prescribing of blood and blood products in accordance with national clinical guidelines
- Safe pre-transfusion procedures
- Safe administration of blood and blood products
- Effective Hospital Transfusion Committees ensuring education and training for prescribers of blood, and regularly monitoring and evaluating blood usage
What is PBM and Does It Really Work?
SABM’s definition of 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 outcome.
Patient Blood Management (PBM)

• Focus has moved beyond blood conservation involving perioperative blood recovery (autologous) and transfusion triggers
• Includes issues such as identifying anaemia before elective surgery, use of point-of-care testing to guide transfusions, use of pharmacologic agents to minimise bleeding
• Multidisciplinary programme
• Individualised patient care, Involves change of behaviour in managing patients who may need blood transfusion
Elements of a Patient Blood Management (PBM) Programme

• Optimising pre-surgical haemoglobin, reducing phlebotomy loss
• Making evidence-based haemotherapy decisions
• Using perioperative autologous donation and red cell recovery techniques
• Minimising perioperative blood loss - topical haemostatics and sealants, ancillary techniques (e.g. positioning of patient, choice of anaesthesia, maintenance of normothermia, meticulous suturing)
• Review of blood utilisation through auditing
• Transfusion Safety Officers (TSOs)
Impact of Introducing PBM

- After implementing PBM, Western Australia’s red cell usage was reduced from 30.47 per 1,000 in 2008/2009 to 27.54 per 1,000 in 2011/2012
  

- The 2011 National Blood Collection and Utilization Survey, conducted by the AABB, credits patient blood management for an 8.2 percent reduction in the use of blood products from 2009 to 2011 - around 1.2 million fewer units of whole blood or red blood cells were transfused in 2011 than in 2009
Changes in the demand for blood _______

The last 10 years has seen major shifts in the demand for blood components both internationally and in New Zealand. Red blood cell and Fresh Frozen Plasma demand has been falling, while the demand in some blood products made from plasma, such as Prothrombinex-VF™, Intragam P® and albuminex®, has doubled.

Clinical use of red cell components has reduced significantly over the period with transfusion rates falling by almost 25% from 29.6 red cells per 1000 population in 2006 to a projected 22.3 per 1000 by the end of 2014. There are a number of reasons for this. There is increasing evidence that a restrictive approach to transfusion in the peri-operative setting leads to at least as good patient outcomes as does a more conservative approach involving maintaining haemoglobin at a higher level. Essentially, maintaining a patient’s haemoglobin level at a slightly lower level appears to not only result in no clinical harm but is also possibly better for them. In New Zealand the decrease in red blood cell usage was initially driven by blood conservation programmes such as “Why use two when one will do?” emanating from Canterbury District Health Board (CDHB). This was subsequently implemented hospital-wide at Auckland DHB and is now being followed in several other DHBs across the country.

Use
Sanquin Annual Report 2013

- Number of platelets (from whole blood in donor units)
- Number of units of fresh frozen plasma
- Kilograms of plasma in total (including apheresis) supplied to Plasma Products divi:

USA

Figure 3-1. Allogeneic, autologous, and total whole blood and red cell collections, 1989-2011.
“... patient blood management means that before surgery every reasonable measure should be taken to optimise the patient’s own blood volume, to minimise the patient’s blood loss and to harness and optimise the patient-specific physiological tolerance of anaemia ... (three pillars of patient blood management)”
A patient blood management program uses a team approach to assess a patient’s blood management needs. The goal of the team is to develop a plan of care that uses pharmaceuticals, technology and techniques to decrease blood loss and to enhance blood cell production. This approach reduces or eliminates the need for a blood transfusion.

What is Patient Blood Management?

Patient Blood Management (PBM) is 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 outcome.
‘Patient Blood Management’
(what’s in a name?)

- Transfusion free care
- Anaemia prevention
- Anaemia treatment
- Blood conservation
- Preoperative assessment
- Intraoperative reduction of blood loss
- Postoperative assessment

- Transfusion tracking/blood utilisation
- Appropriate use of blood products
- Transfusion safety and competency

PRE-EMPTIVE or “PRE”-TRANSFUSION MEASURES

RETROSPECTIVE REVIEW (“POST”- TRANSFUSION) HAEMOVIGILANCE
Don’t transfuse more units of blood than absolutely necessary.
Each unit of blood carries risks. A restrictive threshold (7.0–8.0g/dL) should be used for the vast majority of hospitalized, stable patients without evidence of inadequate tissue oxygenation (evidence supports a threshold of 8.0g/dL in patients with pre-existing cardiovascular disease). Transfusion decisions should be influenced by symptoms and hemoglobin concentration. Single unit red cell transfusions should be the standard for non-bleeding, hospitalized patients. Additional units should only be prescribed after re-assessment of the patient and their hemoglobin value.

Don’t transfuse red blood cells for iron deficiency without hemodynamic instability.
Blood transfusion has become a routine medical response despite cheaper and safer alternatives in some settings. Pre-operative patients with iron deficiency and patients with chronic iron deficiency without hemodynamic instability (even with low hemoglobin levels) should be given oral and/or intravenous iron.

Don’t routinely use blood products to reverse warfarin.
Patients requiring reversal of warfarin can often be reversed with vitamin K alone. Prothrombin complex concentrates or plasma should only be used for patients with serious bleeding or requiring emergency surgery.

Don’t perform serial blood counts on clinically stable patients.
Transfusion of red blood cells or platelets should be based on the first laboratory value of the day unless the patient is bleeding or otherwise unstable. Multiple blood draws to recheck whether a patient’s parameter has fallen below the transfusion threshold (or unnecessary blood draws for other laboratory tests) can lead to excessive phlebotomy and unnecessary transfusions.

Don’t transfuse O negative blood except to O negative patients and in emergencies for women of child bearing potential with unknown blood group.
O negative blood units are in chronic short supply due in part to overutilization for patients who are not O negative. O negative red blood cells should be restricted to: (1) O negative patients; or (2) women of childbearing potential with unknown blood group who require emergency transfusion before blood group testing can be performed.
Appropriate Transfusion Practice in Surgical Patients

98% of all transfusions in surgical patients could be predicted by 3 factors:

1. Pre-operative anaemia
2. Volume of surgical blood loss
3. Failure to adopt a more restrictive Hb threshold trigger for transfusion

3 principle strategies:

(i) Optimise RBC production → increase red cell mass
(ii) Minimise bleeding and blood loss
(ii) Maximise patient’s tolerance of anaemia

Shown to be effective in reducing blood utilization without negative impact on patient outcome
Pre-operative PBM Measures

Adequate *advance preventive preparation* maximises a patient’s functional capacity and tolerance for surgical bleeding to achieve optimal red cell mass, iron stores and coagulation status before surgery starts:

- Treatment of pre-existing anaemia
- Identifying and treating reversible bleeding risk factors prior to elective surgery; best initial screen for surgical bleeding risk is a personal/family bleeding history.
- Cessation or dose adjustment of anticoagulant and anti-platelet drugs
- Optimising ventilation, oxygenation and cardiac output before, during and after surgery.
Detection, evaluation and management of Preoperative anaemia: NATA guidelines

Full blood count at least 28 days before planned surgery
Hb <130 g/L (male) or Hb <120 g/L (female)

Evaluation needed (including iron studies)

- Ferritin <30 mcg/L and/or TSAT <20%
- Ferritin 30–100 mcg/L and/or TSAT <20%
- Ferritin >100 mcg/L and/or TSAT >20%

Rule out iron deficiency

- Iron deficiency: consider referring to gastroenterologist to rule out GI malignancy

Iron therapy
(i) Oral iron in divided doses
(ii) I.V. iron if intolerance to oral iron, gastrointestinal uptake problems or short timeline before surgery

Serum creatinine
- Abnormal
- Normal

Chronic renal disease: Consider referral to nephrologist

Folate and/or Vit B12
- Normal
- Low

Anaemia of chronic disease
No response?
Erythropoietin stimulating agents with iron

Folic acid and/or Vit B12 replacement

Intra-operative PBM Measures

• Anaesthetic blood conservation methods:
  – Intra-operative cell salvage, peri-operative normovolemic hemodilution and permissive/deliberate-induced hypotension.

• Peri-operative use of an anti-fibrinolytic agent (such as IV tranexamic acid) is recommended for patients undergoing cardiac surgery or non-cardiac surgery with anticipated substantial intra-op blood loss (> 1 blood volume).

• Meticulous attention to surgical haemostasis & good surgical technique
Intra-operative PBM Measures

- Avoiding hypothermia, acidosis and tissue hypoxia during surgery
- Prompt diagnosis and appropriate treatment of coagulopathy
- Adopting an intra-operative transfusion algorithm eg. Introduction of Lab-Guided transfusion algorithms led to a 50% reduction in transfusions for cardiac surgery in Mayo Clinic. (2009-2010)
Post-operative PBM Measures

• Early post-operative measures:
  – Monitoring and minimising blood loss
  – Maintain adequate tissue oxygenation/cardiac output
  – Avoid hypothermia

• Investigate and treat post-operative anaemia

• A rationale and restrictive transfusion policy in the post-operative period.

• Post-operative cell salvage (from surgical drains) - considered in patients where significant post-operative blood loss is anticipated (eg. cardiac surgery or total knee replacement surgery)

• Post-operative pharmaceutical prophylaxis may help prevent upper GI bleed.
Patient had RBC and iron stores assessed preoperatively

**EXCLUSION CRITERIA FOR IV FE:**
Elevated hepatic lab studies, recent/active alcohol abuse, history of haemochromatosis, elevated bilirubin, first trimester pregnancy

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**FIRST MORNING POST OPERATIVE ASSESSMENT NON-Cardiac Surgery**

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**POST-OPT PBM Algorithm From WA Dept of Health**
PBM APPS

Description
The AABB PBM app is a first-of-its-kind reference tool for anyone involved in patient blood management (PBM). The app conveniently combines three invaluable PBM resources into one easy-to-reference tool:

AABB Patient Blood Management Support

What's New in Version 1.0.2
Corrected issue with recommendations for hemoglobin values greater than 10 and less than 7.

TransFuse CS
By Mayo Clinic
Open iTunes to buy and download apps.

Description
"TransFuse CS" is a clinical tool for physicians and healthcare professionals working in Cardiac Surgery where transfusion of blood products may be in question. Users input lab data and chest tube output for Cardiac Surgery patients who may require a blood product transfusion. The algorithms will aid in guiding the appropriate clinical decision.

TransFuse CS Support
Application License Agreement

iPhone Screenshot

AABB Red Cell Guidelines
RBC Transfusion Guidelines

Hemoglobin > 10 g/dL
Red cell transfusion not indicated. (Comments)

Hemoglobin 8-10 g/dL

Hemoglobin 7-8 g/dL

Hemoglobin 6-7 g/dL

Hemoglobin <7 g/dL

Hemoglobin <6 g/dL

At a glance

TransFuse CS Mobile
Clinical decision support
Apply guidelines to cases

Education
Learn about transfusion guidelines

Using TransFuse CS Mobile
Directions for using the application

Customer Ratings
We have not received enough ratings to display an average for the current version of this application.

More iPhone Apps by AABB

Customer Ratings
We have not received enough ratings to display an average for the current version of this application.
Is there still a role for Pre-Surgical Autologous Deposit (Pad)
Benefits of Autologous Blood Transfusion

• Lower risk of getting Transfusion Transmitted Infections such as blood borne viral infections (HIV, Viral Hepatitis)
• Ensure the availability of compatible blood for surgery.
• For donors with a rare blood type, this is one way to ensure there will be blood available for the planned surgery.
• Risk of getting an allergic reaction will be very low.
• Patient has an increased sense of control and ownership over his or her own care
Disadvantages of Autologous Blood Transfusion

- Although ABT reduces the incidence of donated (allogeneic) blood transfusion in adult patients undergoing surgery, surgical patients who opt for ABT may still be transfused with donated (allogeneic) blood.
- Patients who underwent pre-surgical ABT also have significantly lower preoperative haemoglobin concentration than patients who did not pre-donate blood - risk of anaemia and iron deficiency on the day of surgery, both of which are associated with poorer clinical outcomes during and after surgery.
Disadvantages of Autologous Blood Transfusion

• Autologous units are often not transfused in situations with minimal surgical bleeding, rate of non-transfusion and wastage can be as high as 50%

• Preoperative autologous collection carries the same risks as allogeneic blood in terms of:
  – Bacterial contamination
  – Clerical and human error
  – Febrile Reactions (FNHTR)
  – Fluid Overload (TACO)
Who Should Have ABT

ABT remains a recommended option for the following groups of patients:

- Elective surgery patients with a rare blood group or require transfusion with rare blood type red cells due to antibodies.
- Children with scoliosis requiring spinal surgery


Implementing a National Patient Blood Management Programme
Principles and Concepts

• Goals: Enhance effective and evidence-based utilization of blood products so as to
  – Optimise patient outcomes and reduce transfusion-related risks by administering transfusion only if potentially beneficial
  – Ensure availability of blood products to those who need them
• Emphasise the importance of hospitals and clinical users taking an active role
• Multidisciplinary approach and applicable to patients from all disciplines
• Not a new concept to clinicians but encourage a shift from a “reactive” to “proactive” approach
• Promote step wise and realistic adoption
Existing Facilitators and Elements

- Hospital Transfusion Committees (HTCs) established in all hospitals since 1990
  - act as the focal point for communication with BSG
  - “ensuring PBM system” added to TOR in 2012
- National Haemovigilance Programme (since 2004, voluntary reporting) and compulsory reporting of serious adverse events to MOH
- Written consent for blood transfusion practised by all public-funded hospitals and major private hospitals
- National Massive Transfusion Protocol since 2011
- BSG practises pre-transfusion audits
National Clinical Guidelines

• National Clinical Practice Guidelines launched in Jan 2011

• Ultimate responsibility of prescribing physician to ensure that blood is transfused based on appropriate evidence-based clinical indication

• Patients must be provided adequate information of risks and benefits, in order to make informed consent
Patient Information Pamphlet

UNDERSTANDING BLOOD TRANSFUSIONS

BLOOD TRANSFUSION RISKS

IS BLOOD TRANSFUSION THE ONLY OPTION?

Patient Information Pamphlet

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NATIONAL
HAEMOVIGILANCE
PROGRAMME, SINGAPORE

Report for January to December 2009

HAEMOVIGILANCE FORM

To: Haemovigilance Co-ordinator
Centre for Transfusion Medicine
Health Sciences Authority
11 Outram Road, Singapore 169078
Mail or Fax: 6222 1932

Reporting date: ___________ Reporting person: __________________________
Tel: __________________ Fax: __________________ H/P or Pager: __________________

PATIENT AND HOSPITAL PARTICULARS

Hospital: __________________ Wards: ________ Date of event: ____________
Patient name (optional): __________________ NRIC (optional): ____________
Age: ________ Sex: ________ Initial diagnosis: __________________
Reason for transfusion: __________________

TRANSFUSION EVENT DETAILS

Date and time of transfusion: ____________
Type of blood products: __________________ Volume infused: __________________
Blood product number: __________________
Leuko-reduced: Y/N Irradiated: Y/N
Symptoms of the adverse event (tick one or more)
- Anuria/oliguria
- Back pain
- Chest pain
-Diabetes
- Haemoglobinuria
- Loin pain
- Low BP
- Peri-orbital Oedema
- Rigors
- Rash
- Sputum
- Unknown

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Improving Awareness

• Getting “buy-in” from stakeholders by BSG
  – Obtained approval from MOH leadership to introduce PBM as a national initiative
  – Obtained endorsement of Hospitals’ Senior Management (Medical Board Chairman)
  – Engaged HTC chairpersons and introduced concept of comprehensive PBM
    • Encouraged to identify at least 1 patient group who will benefit from comprehensive PBM
• Visiting expert in PBM delivered lectures and held discussions with hospitals on their PBM efforts
  – Opportunity to promote awareness of proactive and pre-emptive approaches in PBM
Providing Guidance

• Feedback from HTCs on the need for guidance
• Recommendations written by BSG:
  – Implementation of PBM for patients undergoing elective surgery
    • Elaboration on preoperative management (less awareness and knowledge)
    • Hospitals encouraged to explore intra- and post-operative measures based on capabilities and resources
      – Red Cell transfusion Triggers for non-haemorrhagic patients with chronic anaemia
• Analysis of national blood utilization data in progress: potential for identifying areas for improvement in PBM
Monitoring of effectiveness

• In discussion with hospitals on KPIs
  – Emphasis on indicators of PBM efforts (rather than actual measurement of blood utilization rate) at the current “early” phase
  – Hospitals encouraged to also review and enhance other PBM activities related to these KPIs
Impact of a PBM Programme

Transfusion guideline implementations are associated with a 47% reduction in the odds of death and a 50% decrease of total hospitalization cost after cardiac surgery.

Implementation of an Anemia Management program resulted in a reduction of RBC transfusion by 62%.

25% reduction in hospital stay for non-transfused vs. transfused patients.

First year of implementation expenses for blood products decreased $510,000 in the first year.

COST REDUCTION

LESS TRANSFUSIONS

SHORTER HOSPITAL STAYS
Every cell counts