

Transforming blood usage through cell salvage: Introduction of an obstetric cell salvage service

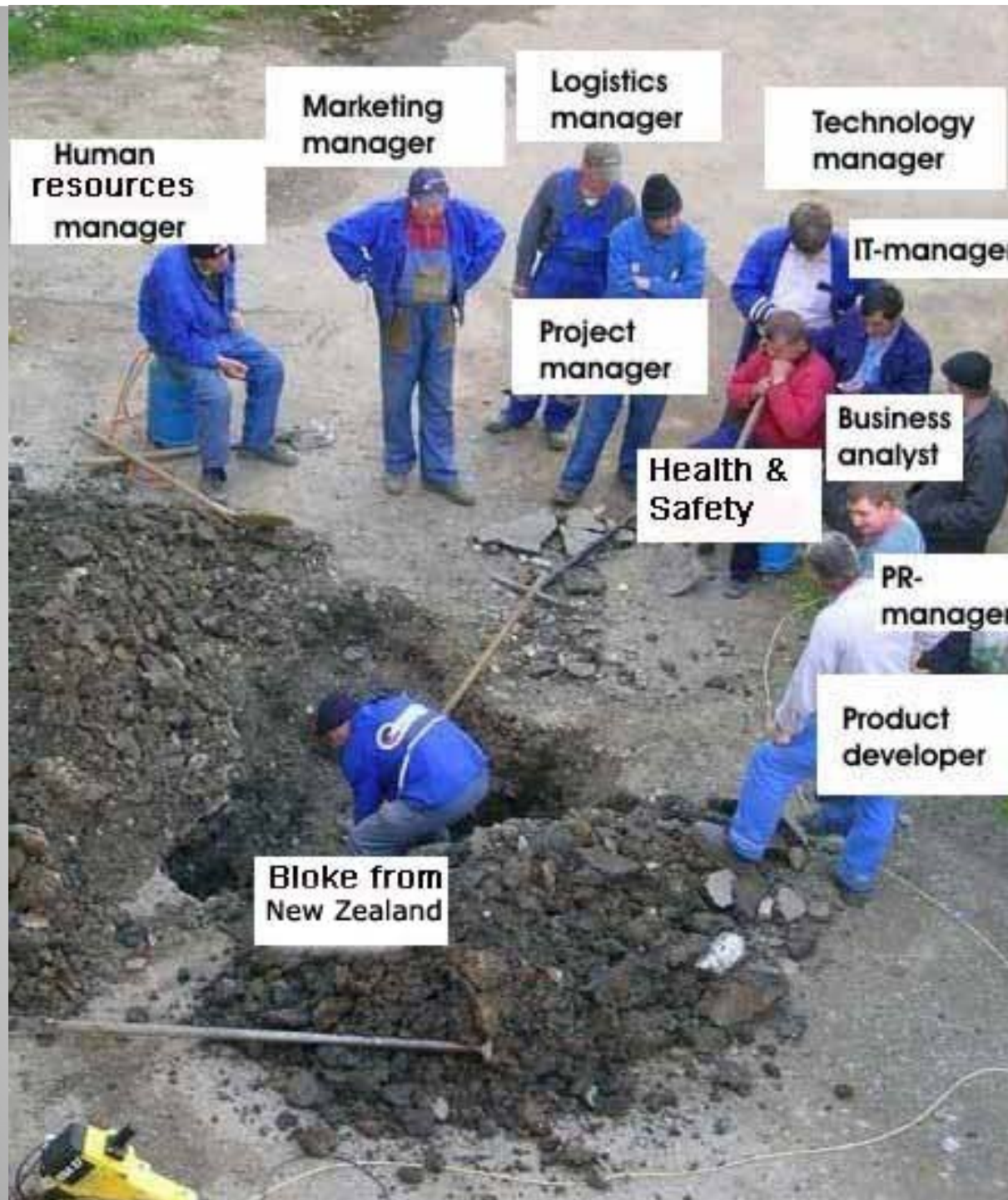
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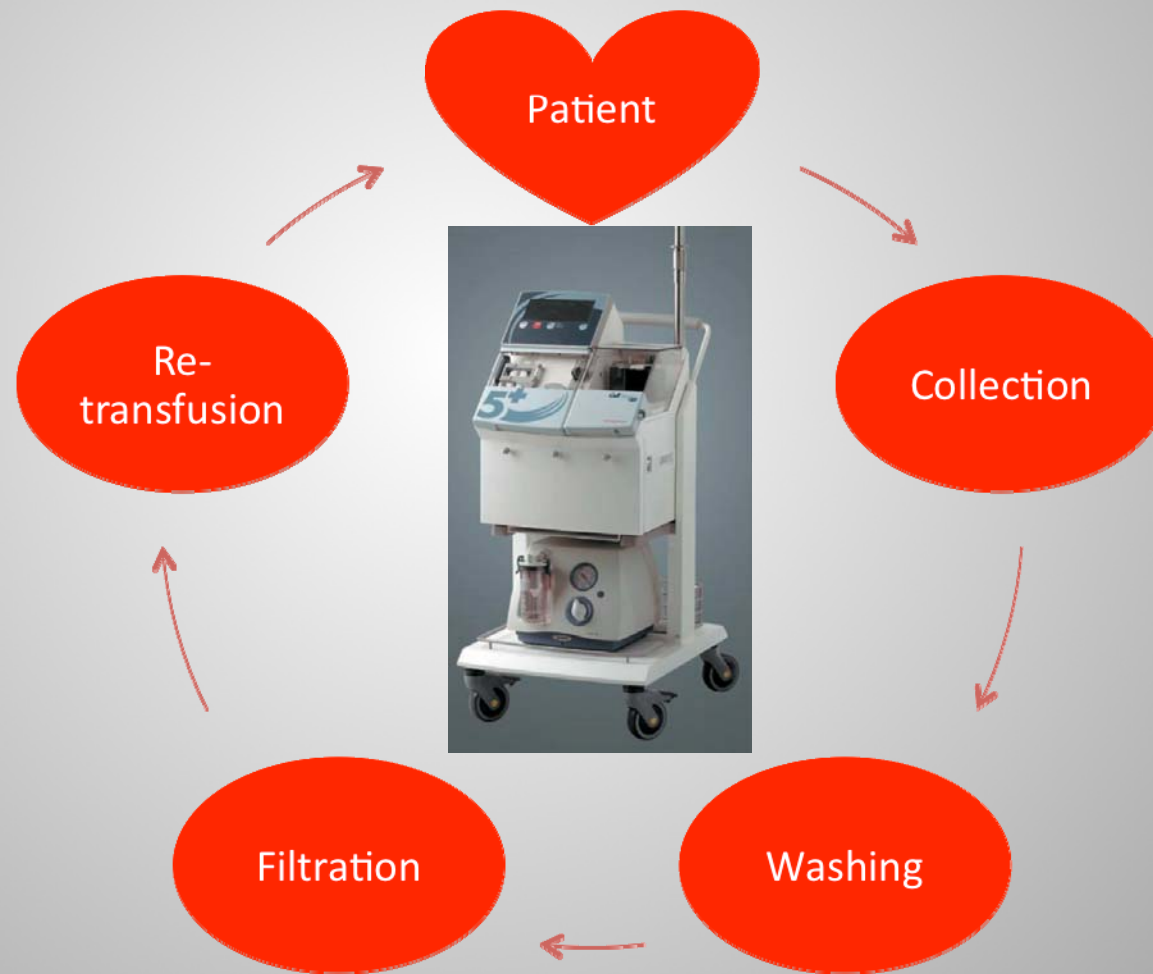
Western Australia



Introduction

- Intraoperative cell salvage developed in the 1970s
 - Widespread use in cardiac, vascular and orthopaedic surgery
- Obstetric use limited by concerns about re-infusion of amniotic fluid
 - First case report 1988
 - Recent interest in its use, especially in high risk obstetric cases
- Assessed for use at KEMH in 2006

The cell salvage process



Aims

Provide an overview of the development and implementation of an obstetric cell salvage service:

1. Why it was considered a clinical priority
2. Review safety in obstetric cases
3. Present KEMH experience as a case study
 - How we introduced it
 - Clinical experience
 - Barriers to change

Why was cell salvage considered
a clinical priority for KEMH?

King Edward Memorial Hospital



King Edward Memorial Hospital

- Operates in relative clinical isolation
 - Stand alone Obstetric & Gynaecology Hospital
 - 6500 deliveries per annum-30% by caesarean
 - Only tertiary referral centre for Western Australia
 - Manages virtually all high risk obstetric cases in house
 - No onsite ICU or interventional radiology
 - 10 mins by Ambulance to nearest tertiary hospital



A typical day at the office?



A typical day at the office?

SENIOR REG
BLOOD BANK E

RBC 55 ✓
FFP 28
Cryo 48
plat 4

Coac 03:10
ANR 1.6
APTT 13
Fib 0.9

Hb 90
Plt 66

Why should obstetric units
consider providing a cell
salvage service?

Why?

1. Complex obstetric cases are increasing
 - Obstetric patients are getting older, heavier and having more complex medical problems
 - Rising caesarean section rate has flow on effects in future pregnancies-it will get worse before it gets better
 - Obstetric haemorrhage remains a leading cause of maternal mortality
 - 14% of maternal deaths in Australia
 - 11% of maternal deaths in the UK

Why?

2. Cell salvaged blood is acceptable to certain patient groups

- Jehovah's Witness patients

- Informed consent for red blood cell salvage during surgery and infusion of salvaged blood should be sought and clearly recorded in the case notes. This facility should be provided for all women who give consent for this procedure.

CEMACH Savings Mothers' Lives 2003-2005

Why?

3. Cell salvaged blood is potentially safer

- Infectious complications are rare with modern transfusion
- Non infectious complications
 - SHOT UK 2006-485 incidents of incorrect blood transfusion compared with 3 of infection
 - transfusion committee
 - Independent risk factor for mortality and morbidity

Blood,
it's safer than it's ever been...

MYTH BUSTED

Bacterial contamination, incompatibility reaction and transfusion-related acute lung injury (TRALI) are still the most common and most immediately dangerous complications of blood transfusion.

SERIOUS RISKS

Non Infectious Risk		RISK PER UNIT (RDU) unless otherwise specified
Haemolytic reactions	Acute	1:12,000 to 38,000
	Delayed	1:4,000 to 12,000
Bacterial sepsis	Platelets	1:100,000
Anaphylaxis - IgA deficiency		1:20,000 to 50,000
Fluid overload / cardiac failure		Up to 1% of patients receiving transfusions
TRALI		1:5,000 to 100,000
Transfusion-associated graft-versus-host disease		Rare

ARCBS Blood Component Information Booklet 2016 *Data based on previous estimates

Patients are often still concerned about the risk of Hepatitis or HIV from blood transfusions. However recent ARCBS statistics show us that the risks of contracting transmissible viruses is a rare occurrence in Australia.

VIRAL RISKS

Current estimated viral risks for Australian blood supply*

HIV	1 in 600,000
HCV	Less than 1 in 10,000,000
HIV-1 and 2	Less than 1 in 10,000,000
HBV	Less than 1 in 10,000,000
vCJD	Possible, not yet reported in Australia. Donors at risk excluded

*Type 1 antibodies for risk of transfusion transmitted and infection from ARCBS donations, calculated using data from 1 January 2005 to 31 December 2006.

A recent review of incidents reported in IMS, the NSW healthcare reporting system, relating to blood or blood products shows that one of the most commonly reported incident types is specimen mislabelling, including wrong blood in tube (WGIT). The importance of correct patient identification at the time of sample collection and labelling as well as the administration of transfusion is critical to patient safety.

For more information about adverse reactions to blood transfusions go to:
www.cec.health.nsw.gov.au and www.transfusion.com.au

Blood Myth #1

Why?

4. And better

- Preserved 2,3 DPG levels
 - McShane et al. Autotransfusion: Quality of blood prepared with a red cell processing device. BJA 1987
- Improved post operative outcomes

A blood transfusion will get my patient home sooner...

MYTH BUSTED

There is emerging evidence that patients transfused after surgery stay longer in hospital and have more infections following discharge.

The CRIT Study¹ shows that RBC transfusions are independently associated with longer ICU and hospital length of stay and increased mortality. Overall there were more complications in the patient cohort and the number of RBC units transfused was an independent predictor of worse clinical outcome.

Multivariate Analysis. The number of RBC units transfused was significantly associated with increased ICU and hospital LOS compared with patients who did not receive transfusions. Patients with a transfusion amount of 1-2, 3-4, and >4 units had a corresponding increase in median ICU LOS of 2.1, 3.8 and 10.1 days, respectively; and an increase in median hospital LOS of 3.5, 6.7 and 16.6 days, respectively, as compared with the median ICU LOS of 4.6 days and hospital LOS of 11.0 days observed in patients who did not receive transfusions.

In addition, a 2006 study² of blood transfusions during cardiac surgery concluded that there was

- a dose-dependent relationship between reductions in functional recovery for the patient and an increase in the units of red blood cells transfused.
- a persistently negative, risk-adjusted effect on health-related quality of life after cardiac surgery that extends well beyond initial hospitalisation.

A blood transfusion is a living tissue transplant. With any transplant the human body is innately primed to react to something foreign. The safety implications of this are significant.

Remember—consider all the factors, not just Hb, before transfusing.

For details on these studies and best practice guidelines on blood transfusions go to:
www.cec.health.nsw.gov.au and www.transfusion.com.au



1 The CRIT Study: Atrial and blood transfusion in the elderly
20. Current critical practice in the elderly cohort
Cohen, Howard E., George, Andrew, Patel, Ravish D, Pitt,
Michael T, Jay, Michael G, Roberts, Conrad, Sessler, Neil
R, Shattil, Michael J, Sun, Hai-Chang, Singer, Marc J
Critical Care Medicine 2012; 41(10):2012-2018
2 Persistent effect of red cell transfusion on health-related quality
of life after cardiac surgery
Kohn, Corbin, Barrow, Michael, Ryan, L L, King,
Edith, Hsieh, Hui, Long, Philip D, Beckwith, Stephen A,
Arora, of Transfusion Services 2012; 13(2): 2008-12

Blood Myth #2

 **BLOOD WATCH**
every day counts

 **NSW HEALTH**

 **Australian Red Cross
BLOOD SERVICE**

 **CLINICAL
EXCELLENCE
COMMISSION**

NATIONAL BLOOD
SECTOR
CONFERENCE 08

Why?

5. There is the potential clinical capacity :

KEMH MTP Activations 2002-2008 n=59

<u>Blood Product</u>	<u>Median Units (Range)</u>
RBCs	12 (8-61)
FFP	6 (2-44)
Cyro	8 (0-40)
Platelets	1 (0-13)

Why?

6. Cell salvaged blood is potentially cost effective
 - Cost per “setup” for salvaged blood \$330
 - Staff training and development costs
 - Avoiding allogenic transfusions may other cost savings
7. Other people say we should be using it!



NHS
National Institute for
Health and Clinical Excellence



NATIONAL BLOOD
SECTOR
CONFERENCE 08

What are the risks?

- Major reason for limited use has been the potential risk of amniotic fluid embolism
- Amniotic fluid and maternal blood mix at caesarean delivery
- “Amniotic fluid embolism”
 - Thought to be secondary to presence of amniotic fluid in maternal circulation
 - Leads to sudden onset of maternal collapse (1:8000), 30-50% mortality
 - Leading cause of direct maternal death in Australia
 - A poorly understood condition-likely immune mediated
 - Amniotic fluid is probably a normal component of the maternal circulation

Amniotic fluid and cell salvage

- Amniotic fluid contains “solute (fluid)” and “debris”
- Washing and centrifuge process very effective at removing “solute”
 - Very good at removing coagulation factors!
- Not so good for removing cellular components
 - Eg fetal red cells, fetal squames, bacteria, cellular debris
 - Using a leucocyte depletion filter dramatically decreases levels of cellular components

Pall LeukoGuard® RS Leukocyte Reduction Filter



Is cell salvage in obstetric cases safe?

Safety of obstetric cell salvage

- “Absence of evidence is not evidence of absence”

Bland and Altman BMJ 1995

- Over 400 obstetric cases in the literature
 - 1 case of heparin toxicity-no adverse consequences
 - 1 reported death ?related
 - HELLP syndrome, no leucocyte depletion filter
- Numbers needed for RCT
 - Assuming 1:8000 AFE, 5 fold increase: 24 000 per group

Introducing cell salvage into KEMH: The “highlights”

Cell Salvage at KEMH

- Multidisciplinary committee-the “drivers”
 - Essential to get buy in from all parties
 - Charge anaesthetic technician, anaesthetist, obstetrician, haematologist and transfusion coordinator
- Equipment (funded by hospital):
 - Haemonetics CS5
 - Pall RS1 Leucocyte depletion filter

QA process

- Quality assurance process established
 - QA process not previously described for obstetric cell salvage
- 25 initial cases
 - Practice initial setup, surgeon familiarity
 - If sufficient blood for processing: assess quality
 - No re-transfusion during this period
- QA indicators:
 - Hct, AFP, Free Hb, K+, Kleihauer

Guidelines for use:

- **Setup:**
 - Collection (\$120)
 - To improve cost effectiveness can “collect only” and then process if ongoing haemorrhage
 - Process/wash (\$180)
 - Filter and transfuse (\$30)
 - JW setup requires all of the above to maintain continuity
- **Suction:**
 - Dedicated separate unit for cell salvage
 - Use pre delivery and then only once amniotic fluid cleared

Who do we use cell salvage for?

- General guidelines:
 - Jehovah's Witness patients at increased risk of bleeding (not uncomplicated LSCS)
 - Obstetric patients at greatly increased risk of bleeding (eg placenta accreta)
 - Other patients refusing traditional transfusion
 - NOT 24/7: Acute haemorrhage situations depending on staff availability
- Not used in lower genital tract bleeding

Experience since March 2007:

- ICS performed in 33 cases (28 obstetric)
 - 4 out of hours cases

Indication	Number
Major placenta praevia with suspected acc/percreta	8
JW with risk factor for haemorrhage	6
Other risk factors for haemorrhage:	
Multiple gestation (Twins and Quads)	2
Fibroids and MPP	1
Ruptured ectopic pregnancy	2
Obscure antibodies with difficulty crossmatching	1
Major gynae procedure	3

Experience since March 2007:

- ICS blood retransfused in 15 patients
 - Average volume: 380 ml
 - Range: 60 ml to 1000 ml
 - Hct: 0.45-0.56
- Adverse events to date
 - 1 episode of unexplained intraop hypotension

Barriers to a change in practice:



Barriers to a change in practice:

McDonnell NJ, Kennedy D, Paech MJ-unpublished survey 2007

- Clinical isolation of obstetric units
 - Staffing levels
 - Staff training
 - Staff familiarity
 - Staff availability afterhours
 - Funding additional staff training/positions
- Lack of clear/readily visible benefits except in JW patients
- Unpredictable nature of obstetric haemorrhage

Conclusions

- Cell salvage represents one technique to reduce red cell use as part of an overall blood management programme
 - Difficult for KEMH its too assess its impact
- Cell salvage provides a valuable option in the management of the high risk obstetric patient
 - But: its only red cells, no coagulation factors
- Who should consider providing an obstetric cell salvage service?
 - Units with cell salvage available in other areas (eg vascular)
 - Obstetric units managing high risk patients frequently
- Traditional transfusion “triggers” should be utilised with commonsense given safety concerns

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