Patient Blood Management

Mike Murphy
Professor of Blood Transfusion Medicine, University of Oxford
Consultant Haematologist, NHS Blood & Transplant/Oxford University Hospitals

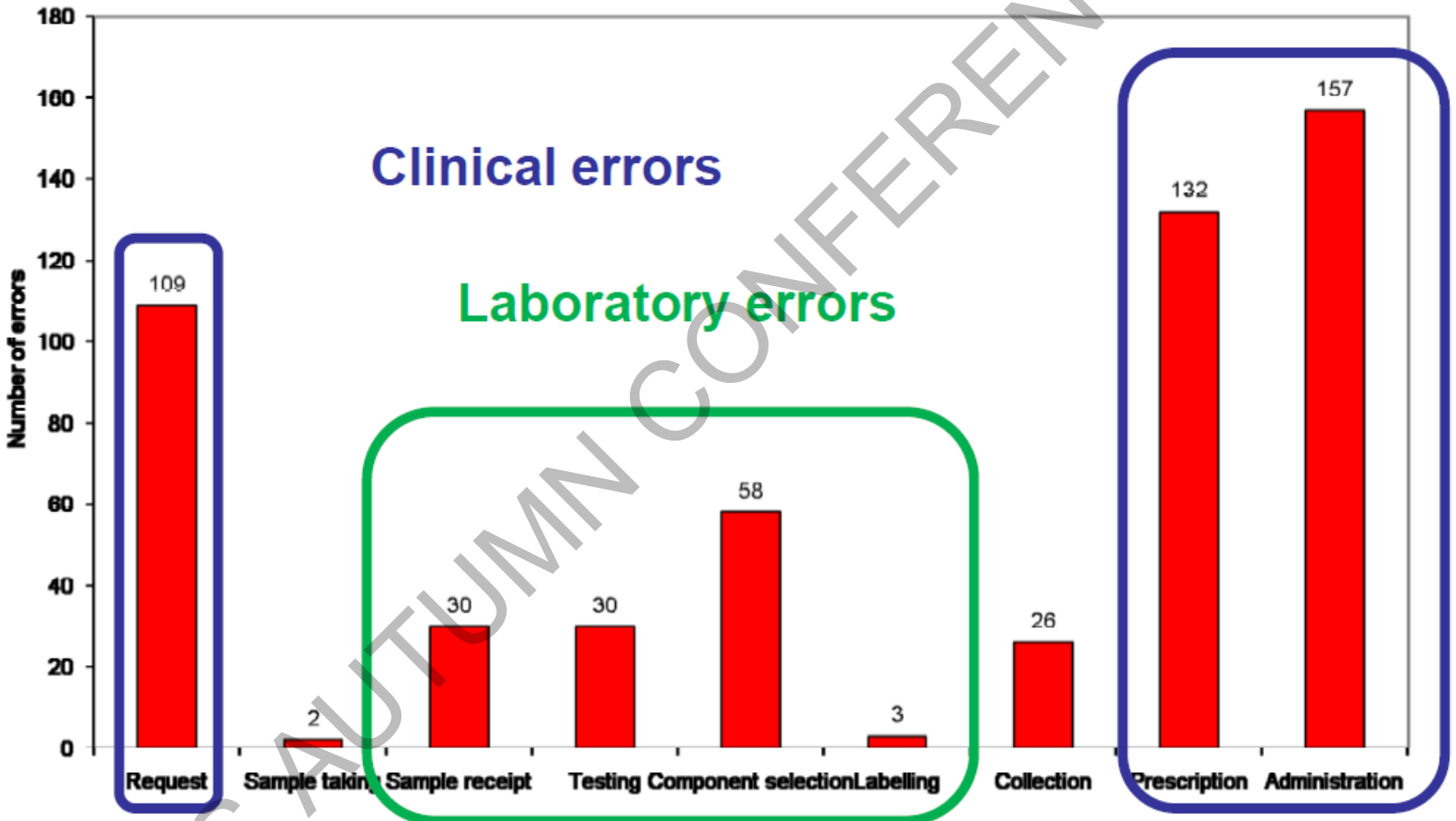
Aims of talk

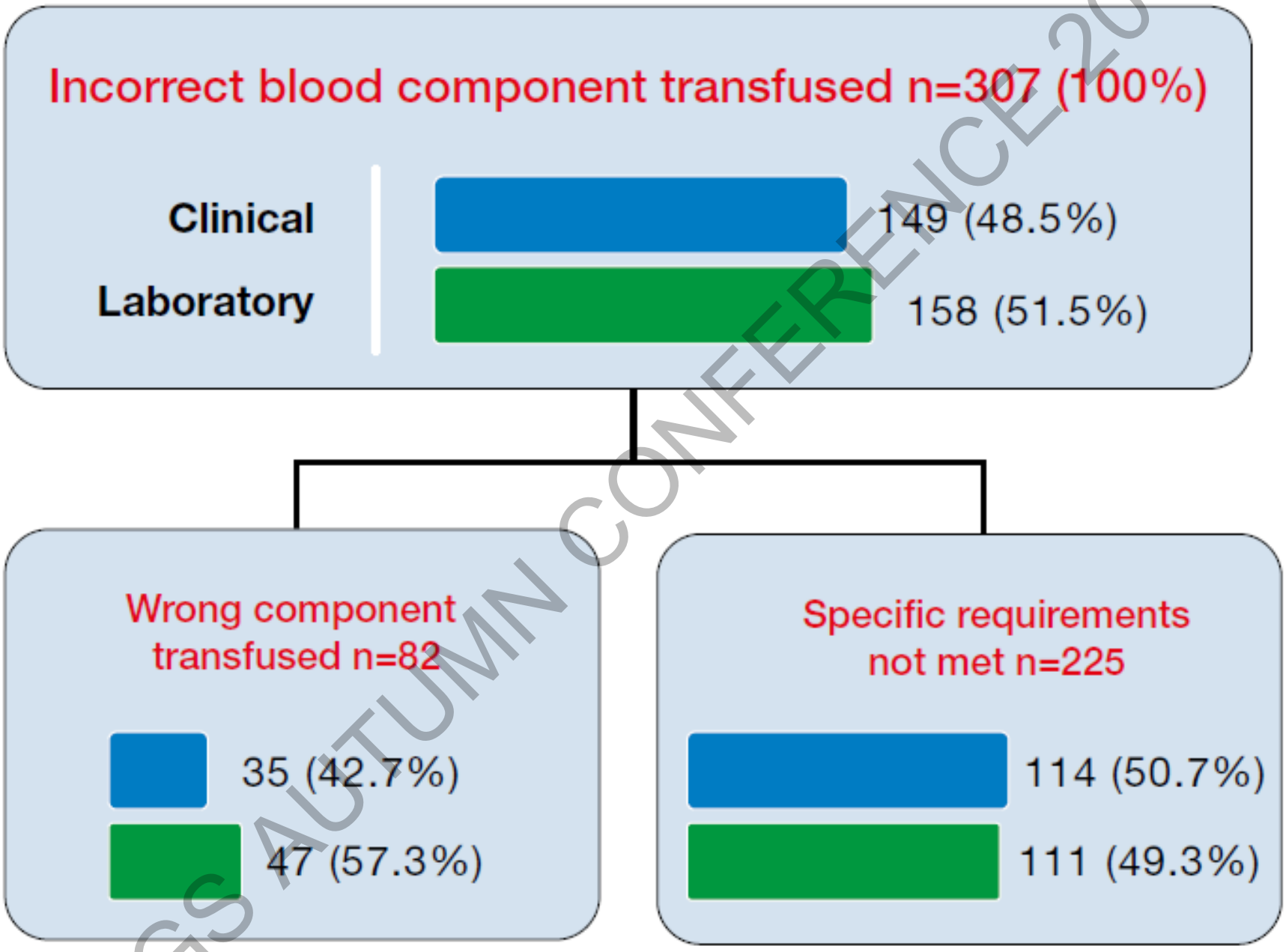
- Describe the current state of transfusion practice in the UK
- Describe recent initiatives for improving transfusion practice and progress in implementing them

How many ABO incompatible red cell transfusions are reported to SHOT each year?

1. 0
2. 1-5
3. 5-10
4. 10-20
5. 20-50

Incorrect blood component transfused
Where are the mistakes made?





What % of transfusions are inappropriate?

1. 0%
2. 1-5%
3. 5-10%
4. 10-20%
5. 20-50%

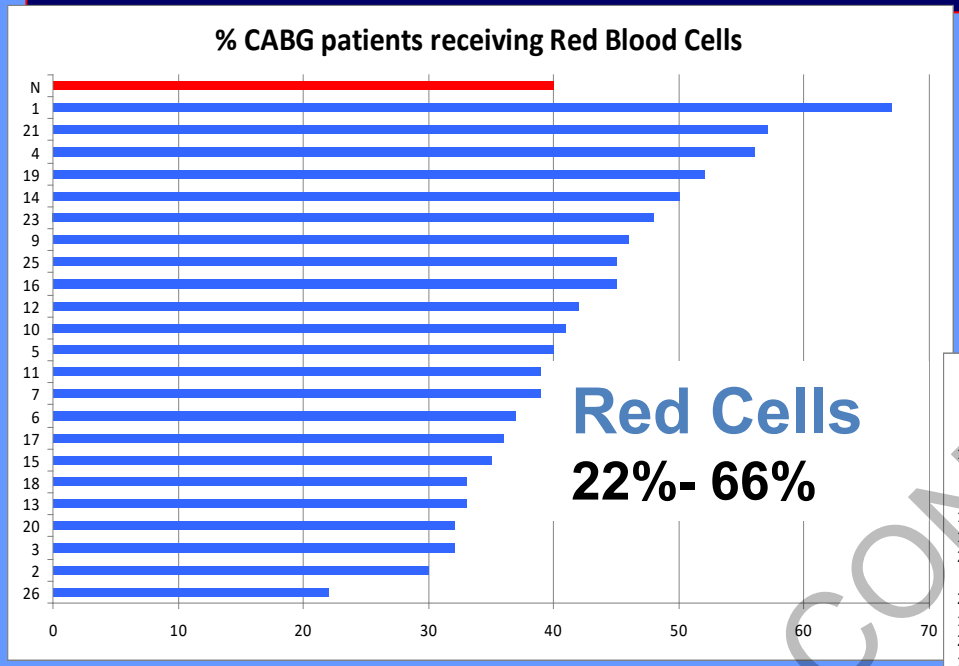
High level of inappropriate use of blood
Data from large regional and national audits of blood use

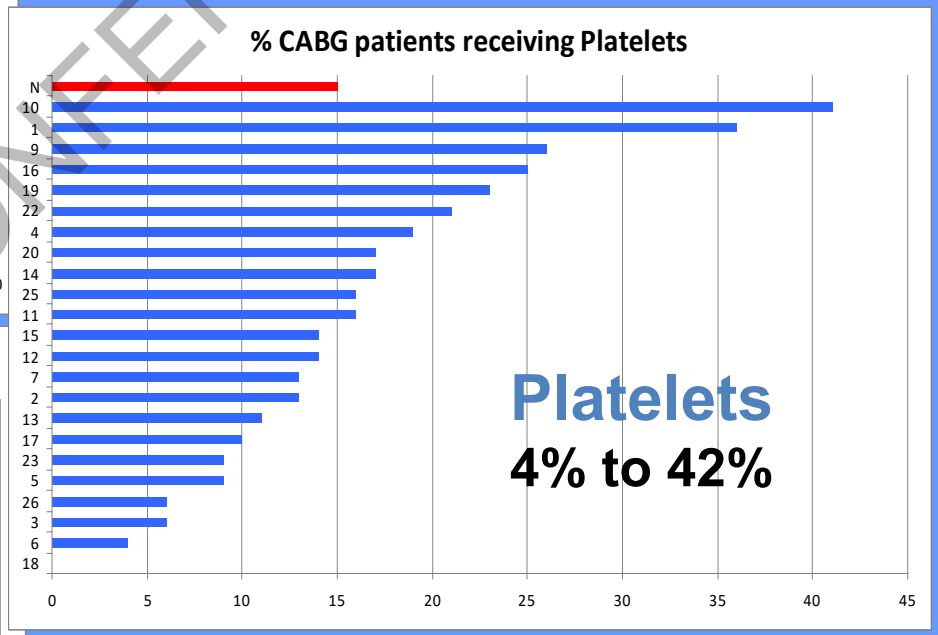
Audit	Year	Number of Hospitals	N cases audited	Inappropriate use	Guideline Standard
Red cell transfusion	2002	All 13 hospitals in N. Ireland	360	19% of patients inappropriately transfused and 29% over-transfused	British Committee for Standards in Haematology (BCSH) (2001)
Red cells in hip replacement	2007	139/167 (83%)	7465	48% of patients	British Orthopaedic Association (2005)
Upper GI bleeding	2007	217/257	6750	15% of RBCs, 42% of platelets, 27% of FFP	British Society of Gastroenterology (2002)
Red cell transfusion	2008	26/56 (46%) hospitals in 2 regions	1113	19.5% of transfusions	BCSH (2001)
FFP	2009	186/248 (75%)	5032	43% of transfusions to adults, 48% to children, 62% to infants	BCSH (2004)
Platelets in haematology	2011	139/153 (91%)	3296	27% of transfusions	BCSH (2003)
Cryoprecipitate	2012	43/82 (52%) from 3 regions	449	25% of transfusions	BCSH (2004)

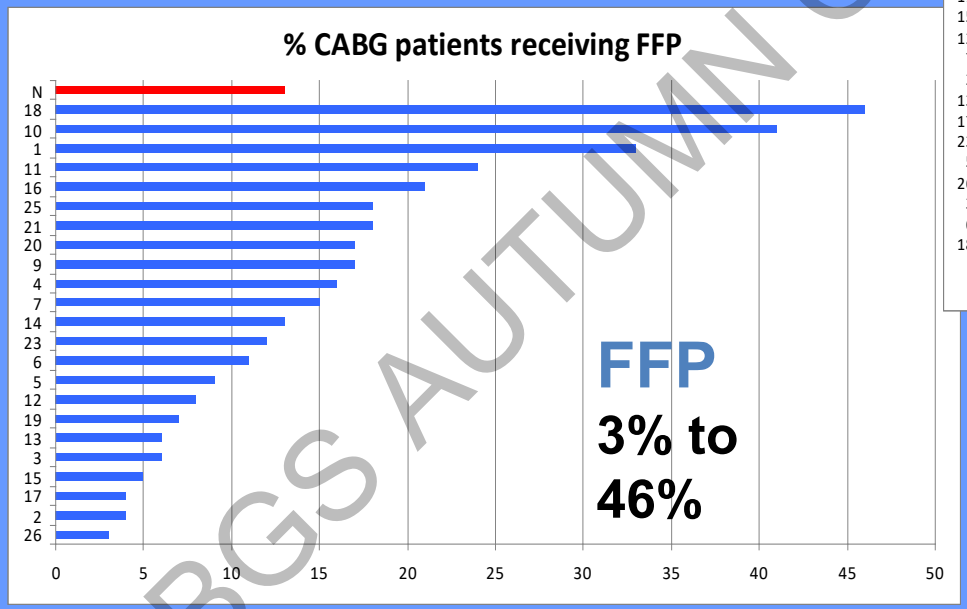
http://hospital.blood.co.uk/safe_use/clinical_audit/National_Comparative/index.asp

Large variation in use of blood by clinical teams

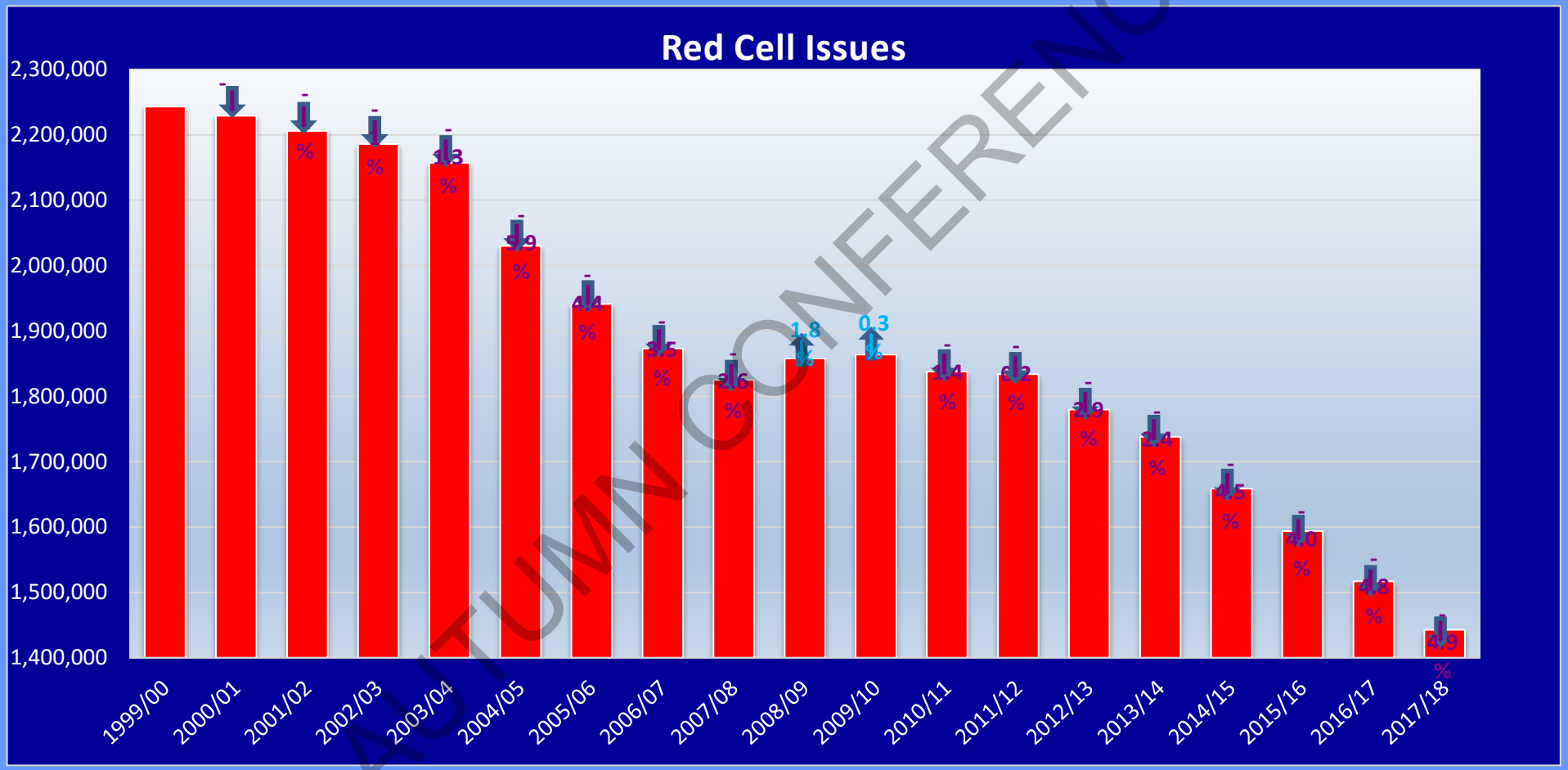
National audit of blood use in cardiac surgery, 2011







Reduction in Red Cell use in England 1999-2018

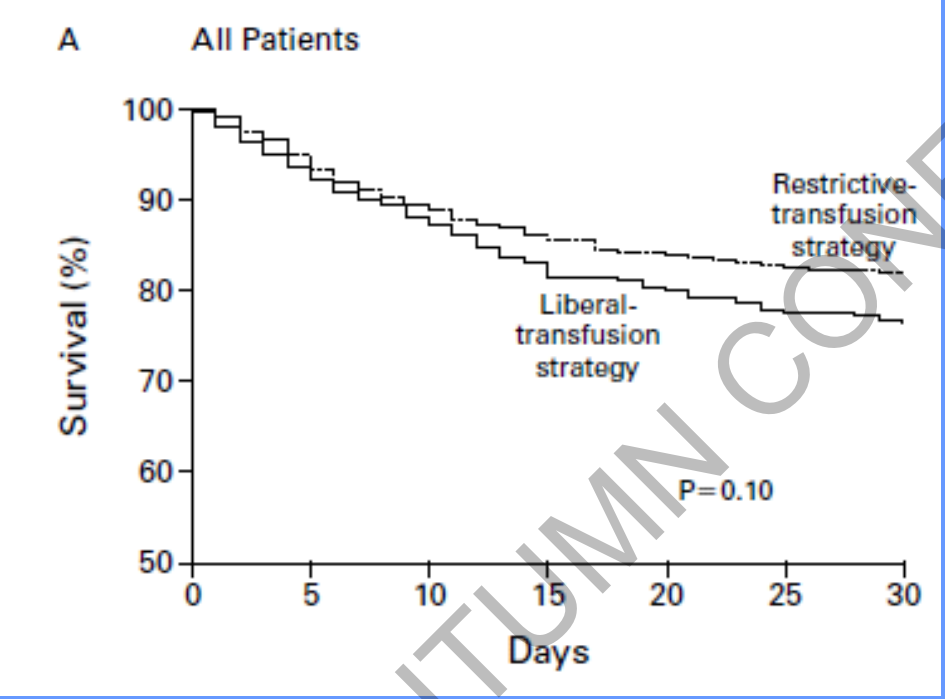


Reasons for changes in blood usage?

- **Improved evidence base for transfusion**
  Hebert et al. Transfusion Requirements in Critical Care (TRICC) trial. NEJM 1999;340:409-417
- **Incorporation of evidence base into high quality guidelines recognised as such by clinicians**
- **Concerns in hospitals about blood costs**
- **Concerns of clinicians and patients about transfusion safety**
- **'*PBM*' and other initiatives e.g. '*Better Blood Transfusion*', '*Choosing Wisely*'**

A MULTICENTER, RANDOMIZED, CONTROLLED CLINICAL TRIAL OF TRANSFUSION REQUIREMENTS IN CRITICAL CARE

PAUL C. HÉBERT, M.D., GEORGE WELLS, PH.D., MORRIS A. BLAJCHMAN, M.D., JOHN MARSHALL, M.D., CLAUDIO MARTIN, M.D., GIUSEPPE PAGLIARELLO, M.D., MARTIN TWEEDDALE, M.D., PH.D., IRWIN SCHWEITZER, M.SC., ELIZABETH YETISIR, M.SC., AND THE TRANSFUSION REQUIREMENTS IN CRITICAL CARE INVESTIGATORS FOR THE CANADIAN CRITICAL CARE TRIALS GROUP*



- 838 euvolaemic ICU patients with Hb <90
- Trigger for red cell transfusion either 70 or 100g/L

Measure	Restrictive	Liberal
Units tx	2.5	5.2
Mean Hb	85	107
Avoided tx	33%	0%
30d mortality	18%	24%

1. Overall mortality similar restrictive v liberal transfusion except for those less than 55 years and less acutely ill
2. Mortality non-significantly higher in patients with cardiac disease

Evidence of benefit with use of restrictive strategy

Transfusion thresholds and other strategies for guiding allogeneic red cell transfusion
Cochrane review, 2016

Outcome	No of patients (studies)	Risk ratio (RR)	Absolute risk difference
No. of patients needing transfusion	12,547 (31 studies)	RR 0.57 (0.49 to 0.65)	-
No. of units transfused	4,674 (12 studies)	-	1.30 units lower (1.85 to 0.75 lower)
30 day mortality	10,537 (23 Studies)	RR 0.97 (0.81 to 1.16)	-

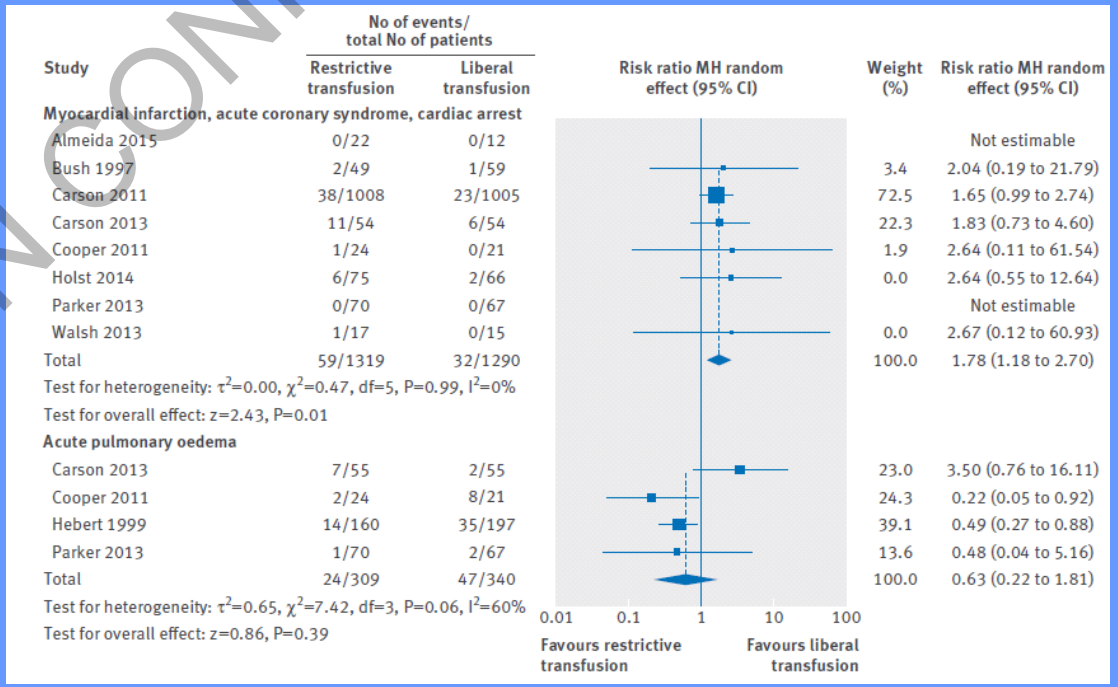
Restrictive red cell transfusion with Hb trigger of 70-80g/L is as safe as a trigger of 90-100g/L over a range of indications with possible exception of acute myocardial infarction

Higher Hb threshold for patients with cardiovascular disease?

Effect of restrictive versus liberal transfusion strategies on outcomes in patients with cardiovascular disease in a non-cardiac surgery setting: systematic review and meta-analysis *BMJ* 2016;352:i1351

Annemarie B Docherty,[1,2] Rob O'Donnell,[2] Susan Brunskill,[3] Marialena Trivella,[3] Carolyn Doree,[4] Lars Holst,[5] Martyn Parker,[6] Merete Gregersen,[7] Juliano Pinheiro de Almeida,[8] Timothy S Walsh,[1,2] Simon J Stanworth[3,9]

- 11 trials of restrictive v liberal transfusion enrolling patients with cardiovascular disease
- No increase in 30d mortality
- Risk of MI, acute coronary syndrome or cardiac arrest was increased in the restrictive group (RR 1.78; 95% CI 1.18-2.70)
- Conclusion: Further trials needed but consider using liberal transfusion trigger (>80g/l) in patients with acute and chronic cardiovascular disease until then



Current national initiatives in transfusion medicine

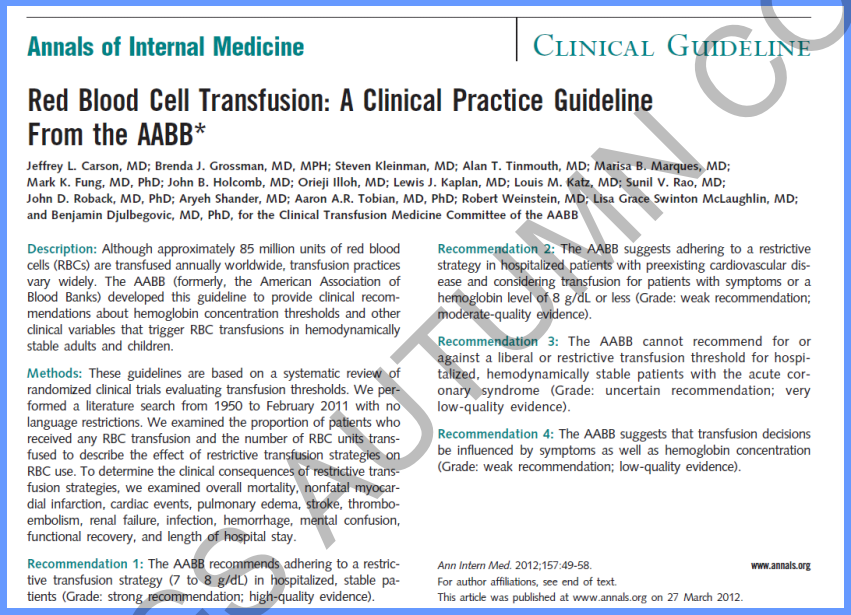
- *UK Transfusion Laboratory Collaborative*
- Guidelines including NICE guidelines and quality standards
- *Choosing Wisely*
- Patient blood management

Recent guidelines for transfusion

Incorporation of evidence base into high quality guidelines recognised as such by clinicians

Carson JL et al. Red blood cell transfusion: AABB clinical practice guideline. Ann Intern Med 2012;157:49-58.

NICE guidelines for blood transfusion (2015): https://www.nice.org.uk/guidance/ng24



Annals of Internal Medicine | CLINICAL GUIDELINE

Red Blood Cell Transfusion: A Clinical Practice Guideline From the AABB*

Jeffrey L. Carson, MD; Brenda J. Grossman, MD, MPH; Steven Kleinman, MD; Alan T. Tinmouth, MD; Marisa B. Marques, MD; Mark K. Fung, MD, PhD; John B. Holcomb, MD; Orieji Illoh, MD; Lewis J. Kaplan, MD; Louis M. Katz, MD; Sunil V. Rao, MD; John D. Roback, MD, PhD; Aryeh Shander, MD; Aaron A.R. Tobian, MD, PhD; Robert Weinstein, MD; Lisa Grace Swinton McLaughlin, MD; and Benjamin Djulbegovic, MD, PhD, for the Clinical Transfusion Medicine Committee of the AABB

Description: Although approximately 85 million units of red blood cells (RBCs) are transfused annually worldwide, transfusion practices vary widely. The AABB (formerly, the American Association of Blood Banks) developed this guideline to provide clinical recommendations about hemoglobin concentration thresholds and other clinical variables that trigger RBC transfusions in hemodynamically stable adults and children.

Methods: These guidelines are based on a systematic review of randomized clinical trials evaluating transfusion thresholds. We performed a literature search from 1950 to February 2011 with no language restrictions. We examined the proportion of patients who received any RBC transfusion and the number of RBC units transfused to describe the effect of restrictive transfusion strategies on RBC use. To determine the clinical consequences of restrictive transfusion strategies, we examined overall mortality, nonfatal myocardial infarction, cardiac events, pulmonary edema, stroke, thromboembolism, renal failure, infection, hemorrhage, mental confusion, functional recovery, and length of hospital stay.

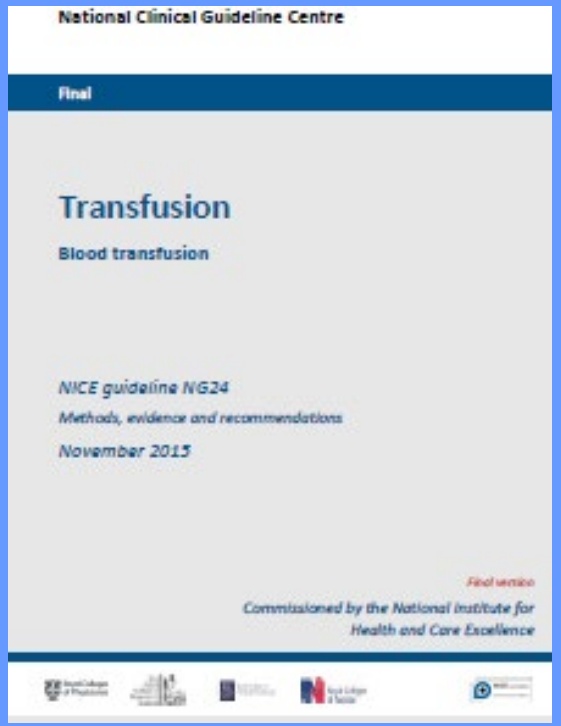
Recommendation 1: The AABB recommends adhering to a restrictive transfusion strategy (7 to 8 g/dL) in hospitalized, stable patients (Grade: strong recommendation; high-quality evidence).

Recommendation 2: The AABB suggests adhering to a restrictive strategy in hospitalized patients with preexisting cardiovascular disease and considering transfusion for patients with symptoms or a hemoglobin level of 8 g/dL or less (Grade: weak recommendation; moderate-quality evidence).

Recommendation 3: The AABB cannot recommend for or against a liberal or restrictive transfusion threshold for hospitalized, hemodynamically stable patients with the acute coronary syndrome (Grade: uncertain recommendation; very low-quality evidence).

Recommendation 4: The AABB suggests that transfusion decisions be influenced by symptoms as well as hemoglobin concentration (Grade: weak recommendation; low-quality evidence).

Ann Intern Med. 2012;157:49-58. www.annals.org
For author affiliations, see end of text.
This article was published at www.annals.org on 27 March 2012.



National Clinical Guideline Centre

Final

Transfusion

Blood transfusion

NICE guideline NG24

Methods, evidence and recommendations

November 2015

Final version

Commissioned by the National Institute for Health and Care Excellence

NICE recommendations for RBC transfusion

Thresholds and targets

- Use restrictive RBC transfusion thresholds for patients who need RBC transfusions and who do not have major haemorrhage or acute coronary syndrome
- When using a restrictive RBC transfusion threshold, consider a Hb threshold of 70 g/l and a Hb target of 70–90 g/l after transfusion
- Consider a RBC transfusion threshold of 80 g/l and a Hb target of 80–100 g/l for patients with acute coronary syndrome
- Consider individual Hb thresholds and targets for patients on regular transfusions for chronic anaemia

NICE guideline on Transfusion, November 2015

https://www.nice.org.uk/guidance/ng24

NICE recommendations for RBC transfusion

Doses

- **Consider single-unit RBC transfusions for adults who do not have active bleeding**
- **After each single-unit RBC transfusion clinically reassess and check the Hb, and give further transfusions if needed**

NICE guideline on Transfusion, November 2015

https://www.nice.org.uk/guidance/ng24

NICE Quality Standards

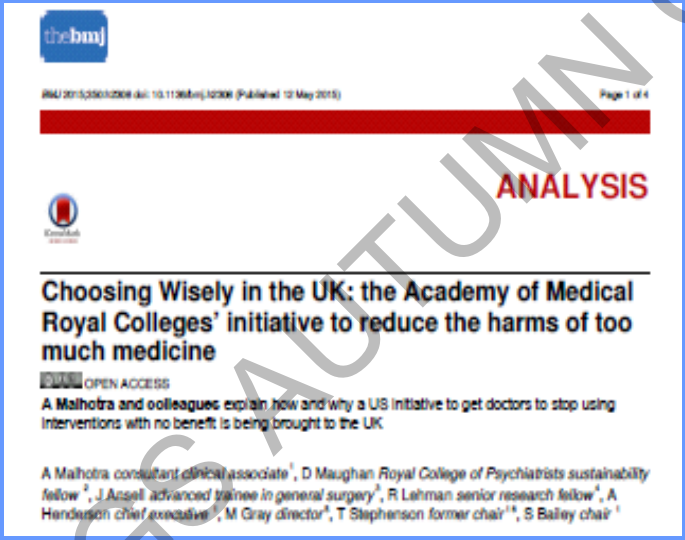
1. People who may have or who have had a transfusion are given verbal and written information about the benefits and risks of transfusion
2. People who receive a red cell transfusion are clinically reassessed and have their Hb checked after each unit
3. Adults who having surgery and expected to have moderate blood loss are offered tranexamic acid
4. People with iron deficiency anaemia are offered iron supplementation before and after surgery

How to implement better transfusion practice

National/international initiatives to avoid over-use of diagnostic tests and treatments

Choosing Wisely®

An initiative of the ABIM Foundation



the bmj

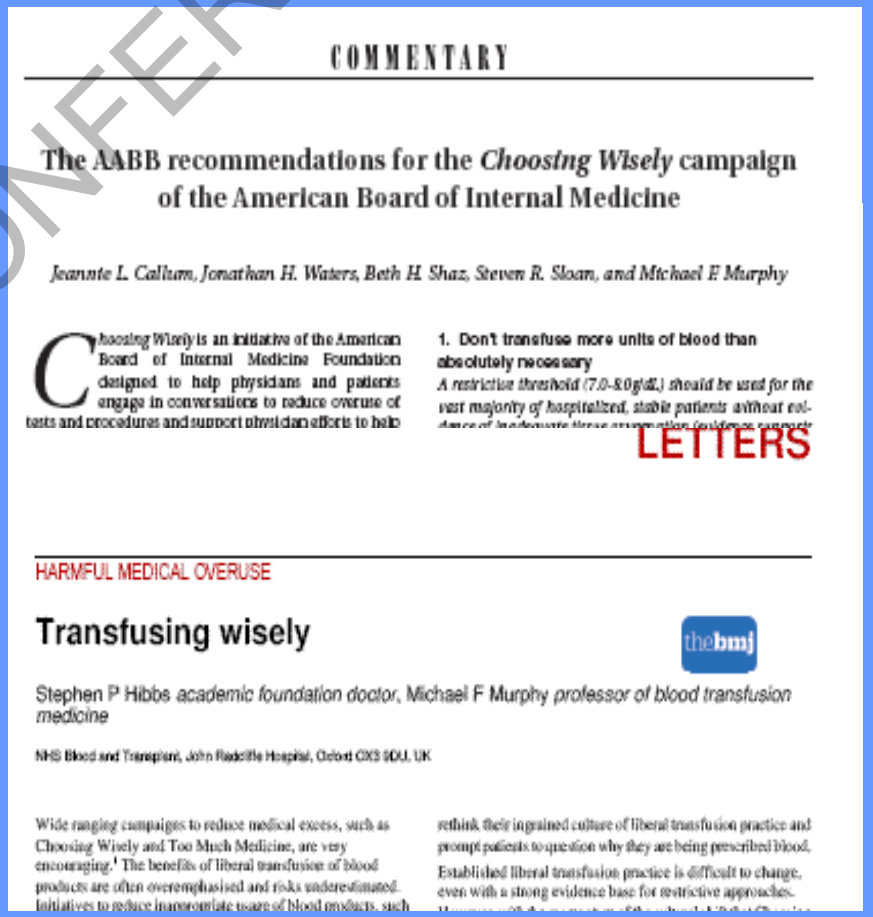
ANALYSIS

Choosing Wisely in the UK: the Academy of Medical Royal Colleges' initiative to reduce the harms of too much medicine

OPEN ACCESS

A Malhotra and colleagues explain how and why a US initiative to get doctors to stop using interventions with no benefit is being brought to the UK

A Malhotra consultant clinical associate[1], D Maughan Royal College of Psychiatrists sustainability fellow[2], J Ansell advanced trainee in general surgery[3], R Lehman senior research fellow[4], A Henderson chief executive[5], M Gray director[4], T Stephenson former chair[1 6], S Bailey chair[1]



COMMENTARY

The AABB recommendations for the *Choosing Wisely* campaign of the American Board of Internal Medicine

Jeannie L. Callum, Jonathan H. Waters, Beth H. Shaz, Steven R. Sloan, and Michael F Murphy

Choosing Wisely is an initiative of the American Board of Internal Medicine Foundation designed to help physicians and patients engage in conversations to reduce overuse of tests and procedures and support physician efforts to help

1. Don't transfuse more units of blood than absolutely necessary

A restrictive threshold (7.0-8.0 g/dL) should be used for the vast majority of hospitalized, stable patients without evi-

LETTERS

HARMFUL MEDICAL OVERUSE

Transfusing wisely

the bmj

Stephen P Hibbs *academic foundation doctor*, Michael F Murphy *professor of blood transfusion medicine*

NHS Blood and Transplant, John Radcliffe Hospital, Oxford OX3 9DU, UK

Wide ranging campaigns to reduce medical excess, such as Choosing Wisely and Too Much Medicine, are very encouraging.[1] The benefits of liberal transfusion of blood products are often overemphasised and risks underestimated. Initiatives to reduce inappropriate usage of blood products, such

rethink their ingrained culture of liberal transfusion practice and prompt patients to question why they are being prescribed blood.

Established liberal transfusion practice is difficult to change, even with a strong evidence base for restrictive approaches.

Choosing Wisely®

An initiative of the ABIM Foundation

Choosing Wisely: 5 questions to ask your doctor before you get any test, treatment or procedure

Do I really need this test or procedure?

What are the risks?

Are there simpler, safer options?

What happens if I don't do anything?

How much does it cost?

ACADEMY OF MEDICAL ROYAL COLLEGES

Recommendations on blood transfusion by the UK *Choosing Wisely* campaign (2015)

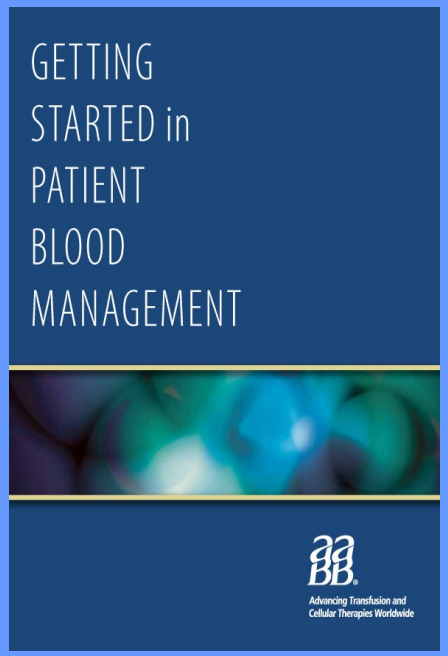
1. Use restrictive thresholds for patients needing red cell transfusions and give only one unit at a time except when the patient has active bleeding
2. Only consider transfusing platelets for patients with chemotherapy-induced thrombocytopenia where the platelet count is < 10 x 109/L except when the patient has clinical significant bleeding or will be undergoing a procedure with a high risk of bleeding
3. Don't transfuse O negative blood except to O negative patients and in emergencies for women of child bearing potential with unknown blood group

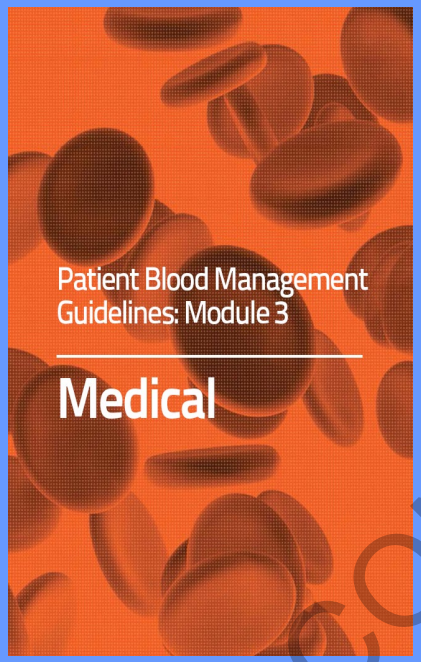
ACADEMY OF MEDICAL ROYAL COLLEGES

Recommendations on blood transfusion by the UK *Choosing Wisely* campaign (2015)

4. Don’t transfuse red blood cells for iron deficiency without haemodynamic instability
5. Don't give a patient a blood transfusion without informing them about the risks and benefits of transfusion (although do not delay an emergency transfusion)

Patient Blood Management (PBM)





Definition: ***An evidence-based, multidisciplinary approach to optimising the care of patients who might need a blood transfusion***

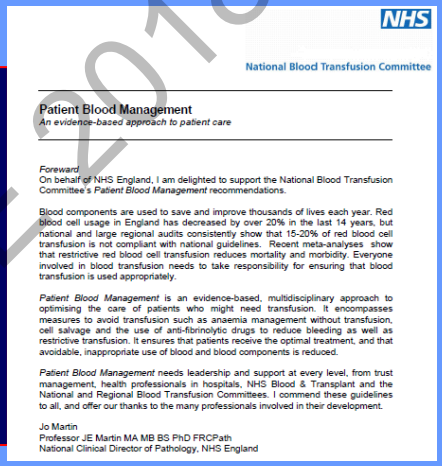
PBM includes:-

- Minimising blood sample volume
- Appropriate transfusion triggers
- Managing anaemia
- Intra- and post-op management e.g. cell salvage, assessing and managing abnormal haemostasis
- Data collection on transfusion (which patients, how much blood)
- Feedback of data to clinicians and ideally decision support

Choosing Wisely®
An initiative of the ABIM Foundation

Guidelines for the implementation of PBM

National Blood Transfusion Committee (England) recommendations (2014)



NHS

National Blood Transfusion Committee

Patient Blood Management

An evidence-based approach to patient care

Foreward

On behalf of NHS England, I am delighted to support the National Blood Transfusion Committee's *Patient Blood Management* recommendations.

Blood components are used to save and improve thousands of lives each year. Red blood cell usage in England has decreased by over 20% in the last 14 years, but national and large regional audits consistently show that 15-20% of red blood cell transfusion is not compliant with national guidelines. Recent meta-analyses show that restrictive red blood cell transfusion reduces mortality and morbidity. Everyone involved in blood transfusion needs to take responsibility for ensuring that blood transfusion is used appropriately.

Patient Blood Management is an evidence-based, multidisciplinary approach to optimising the care of patients who might need transfusion. It encompasses measures to avoid transfusion such as anaemia management without transfusion, cell salvage and the use of anti-fibrinolytic drugs to reduce bleeding as well as restrictive transfusion. It ensures that patients receive the optimal treatment, and that avoidable, inappropriate use of blood and blood components is reduced.

Patient Blood Management needs leadership and support at every level, from trust management, health professionals in hospitals, NHS Blood & Transplant and the National and Regional Blood Transfusion Committees. I commend these guidelines to all, and offer our thanks to the many professionals involved in their development.

Jo Martin
Professor JE Martin MA MB BS PhD FRCPath
National Clinical Director of Pathology, NHS England

D. Implementation of PBM

Implementation of good practice for blood avoidance and the use of blood
• Analyse casemix and clinical services to determine the main targets for PBM
• Identify PBM champions to help educate staff and patients
• Establish a PBM committee (either stand-alone or within the Hospital Transfusion Committee) to oversee the PBM programme
• Obtain a mandate for PBM from hospital management
• Educate clinicians about PBM and evidence-based transfusion practice
• Adopt a PBM scorecard to share with senior NHS Trust members to monitor adherence to guidelines for blood avoidance and the use of blood, including the use of benchmarking to identify clinicians/clinical teams who are consistently well outside of average blood use for a specific procedure

http://www.transfusionguidelines.org.uk/uk-transfusion-committees/national-blood-transfusion-committee/patient-blood-management

How well has PBM been implemented in England?

1. Fully implemented
2. Well implemented
3. Moderately well
4. Hardly implemented
5. Not implemented at all

PBM Surveys England 2013 & 2015

	2013	2015
Response	146/149 (98%)	136/149 (91%)
≥1 WTE Transfusion Practioner	76%	70%
Transfusion Practitioner time spent on supporting PBM	<30% time in 65% of hospitals	PBM ranked lowest after education, competency assessment, incident investigation and tracing fate of blood
Hospitals with haematologists with transfusion sessions	54%	72%
Audits of blood usage	50%	74%
Reports to clinical teams on blood usage	<50%	60%
Cross-charge for blood costs	33%	34%

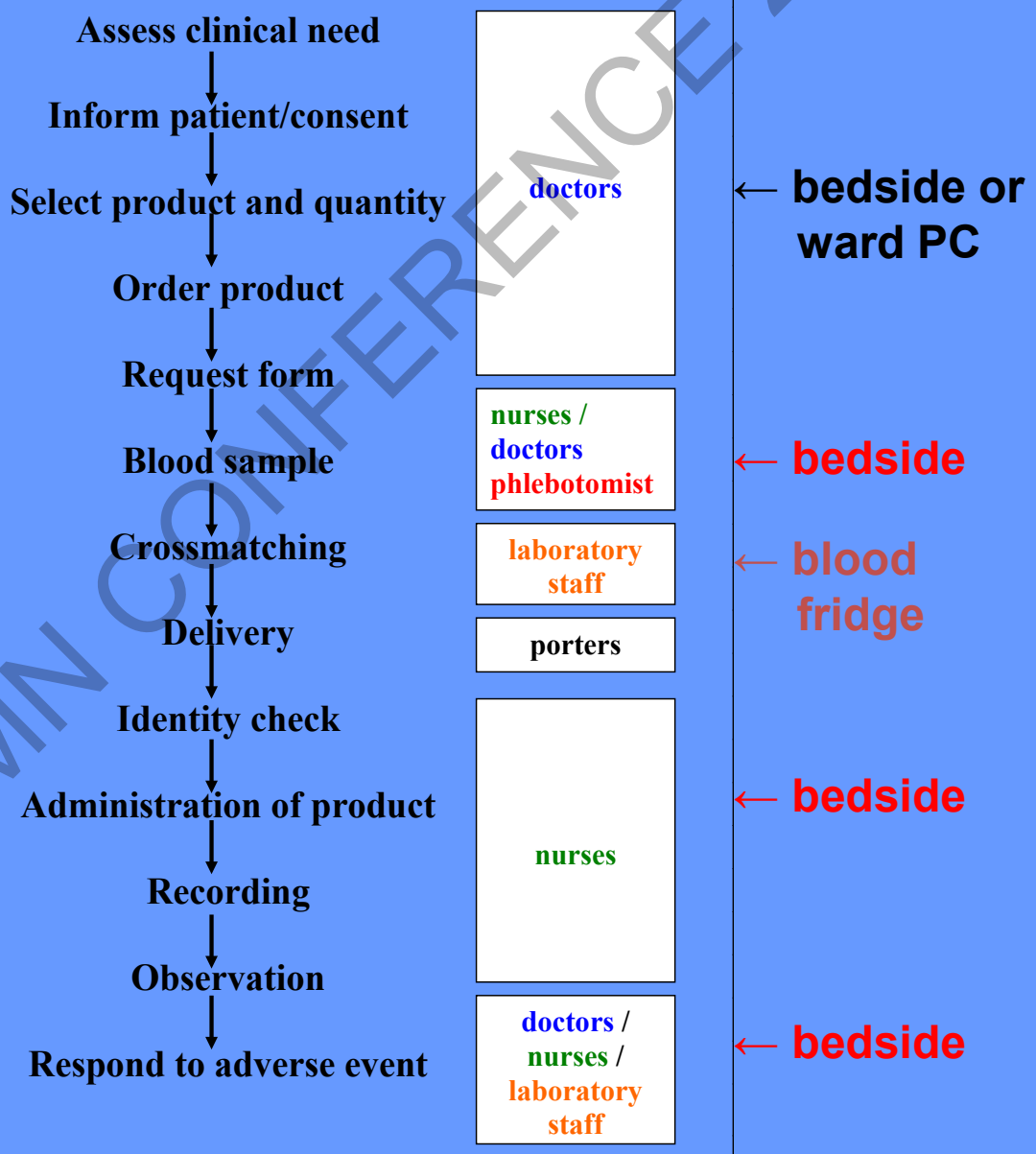
PBM Survey England 2015

		Yes, the policy covers all areas	Yes, but it covers only specific areas	No, but we are planning to	No, we do not intend to implement such a policy
Red Cells Have you implemented a lower transfusion threshold policy for red cells in non-bleeding patients?	128	54	12	45	17
	100%	42%	9%	35%	13%
Single Unit Do you have a single unit red cell transfusion policy?	129	35	11	68	15
	100%	27% (29%)	8%	53%	12%
ATD Platelets Do you have a policy for transfusing one ATD of platelets at a time in non-bleeding patients	129	90	6	25	8
	100%	70% (50%)	5%	19%	6%

What resources are needed to implement PBM?

- Not well described or evidence based
- Depends on resources already available and on the objectives of the PBM initiative
- Benchmarking, feedback of data, use of dashboards etc are key
- Good IT is a major enabler
- Provides other benefits e.g. feedback of data to blood services for demand planning

Hospital transfusion process



Standard pre-transfusion process

Lots of paper work (nursing and medical notes, prescription, observation chart, compatibility report form)

2 nurses (1 nurse reading information from blood pack, 2nd nurse cross-referencing with all the different paperwork)

27 individual steps to be carried out before safe to commence the transfusion

End-to-end electronic process for transfusion safety

Transfusion safety at the bedside

Assess clinical need	doctors	← bedside or ward PC
Inform patient/consent		
Select product and quantity		
Order product		
Request form		
Blood sample	nurses / doctors phlebotomist	← bedside
Crossmatching	laboratory staff	← blood fridge
Delivery	porters	
Identity check	nurses	← bedside
Administration of product		
Recording		
Observation		
Respond to adverse event	doctors / nurses / laboratory staff	← bedside

End-to-end electronic process for transfusion safety

Transfusion safety at blood fridges

Assess clinical need	doctors	← bedside or ward PC
Inform patient/consent		
Select product and quantity		
Order product		
Request form		
Blood sample	nurses / doctors phlebotomist	← bedside
Crossmatching	laboratory staff	← blood fridge
Delivery	porters	
Identity check	nurses	← bedside
Administration of product		
Recording		
Observation		
Respond to adverse event	doctors / nurses / laboratory staff	← bedside

Oxford Centralised Transfusion Service

NHSBT
Blood supplier

HORTON
District hospital with satellite blood bank 30 miles from JR

National awards

JOHN RADCLIFFE (JR)
Central blood bank

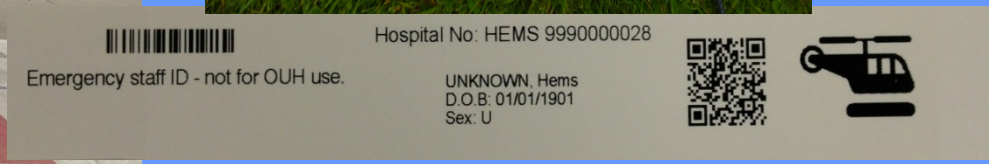
COMMUNITY HOSPITALS AND AT HOME

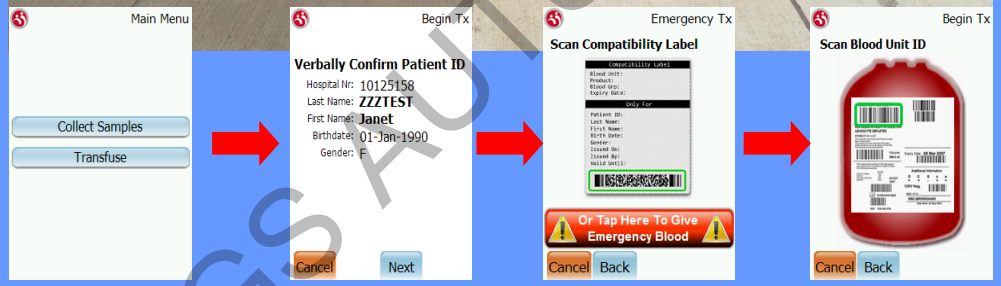
CHURCHILL
Acute hospital 2 miles from JR

NOC
Specialist orthopaedic hospital 2 miles from JR

NHSBT: Reference RCI, H & I, SCI etc; blood product provision; electronic requesting of blood and diagnostic tests and issuing of reports; clinical and scientific advice.
JR lab: Hub: routine and urgent sample testing 24/7; product provision; antibody identification (all but very complex).
Spoke with lab: urgent requests; product provision.
Spoke without lab: product provision.

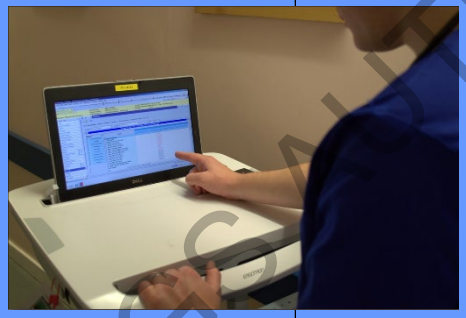
“Blood on Board”





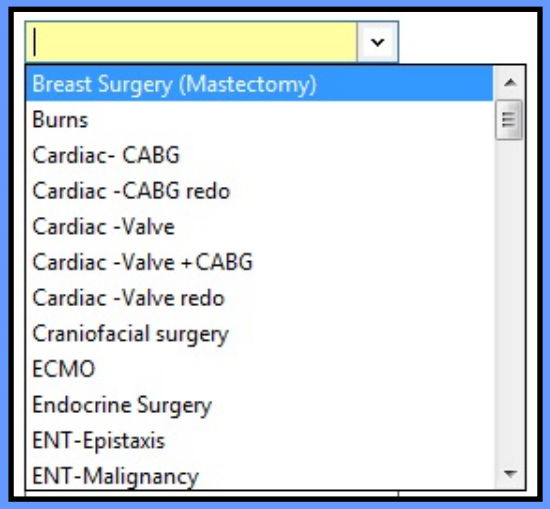
Development of electronic blood ordering

'Decision support'
for better practice



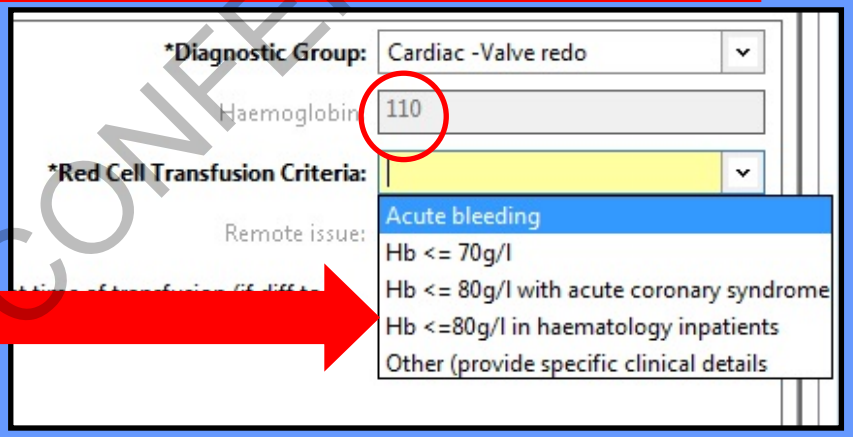
Assess clinical need	doctors	← bedside or ward PC
Inform patient/consent		
Select product and quantity		
Order product		
Request form		
Blood sample	nurses / doctors phlebotomist	← bedside
Crossmatching	laboratory staff	← blood fridge
Delivery	porters	
Identity check	nurses	← bedside
Administration of product		
Recording		
Observation		
Respond to adverse event	doctors / nurses / laboratory staff	← bedside

Electronic blood ordering and decision support



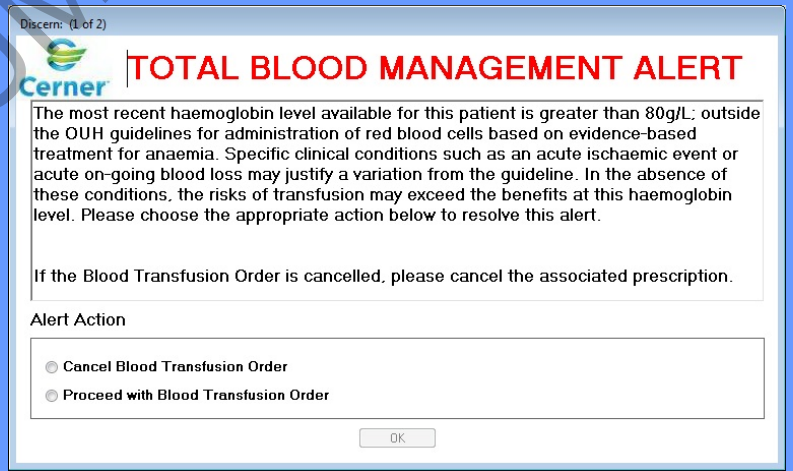
1 Capture the diagnostic group

Automatic capture of the most recent relevant result

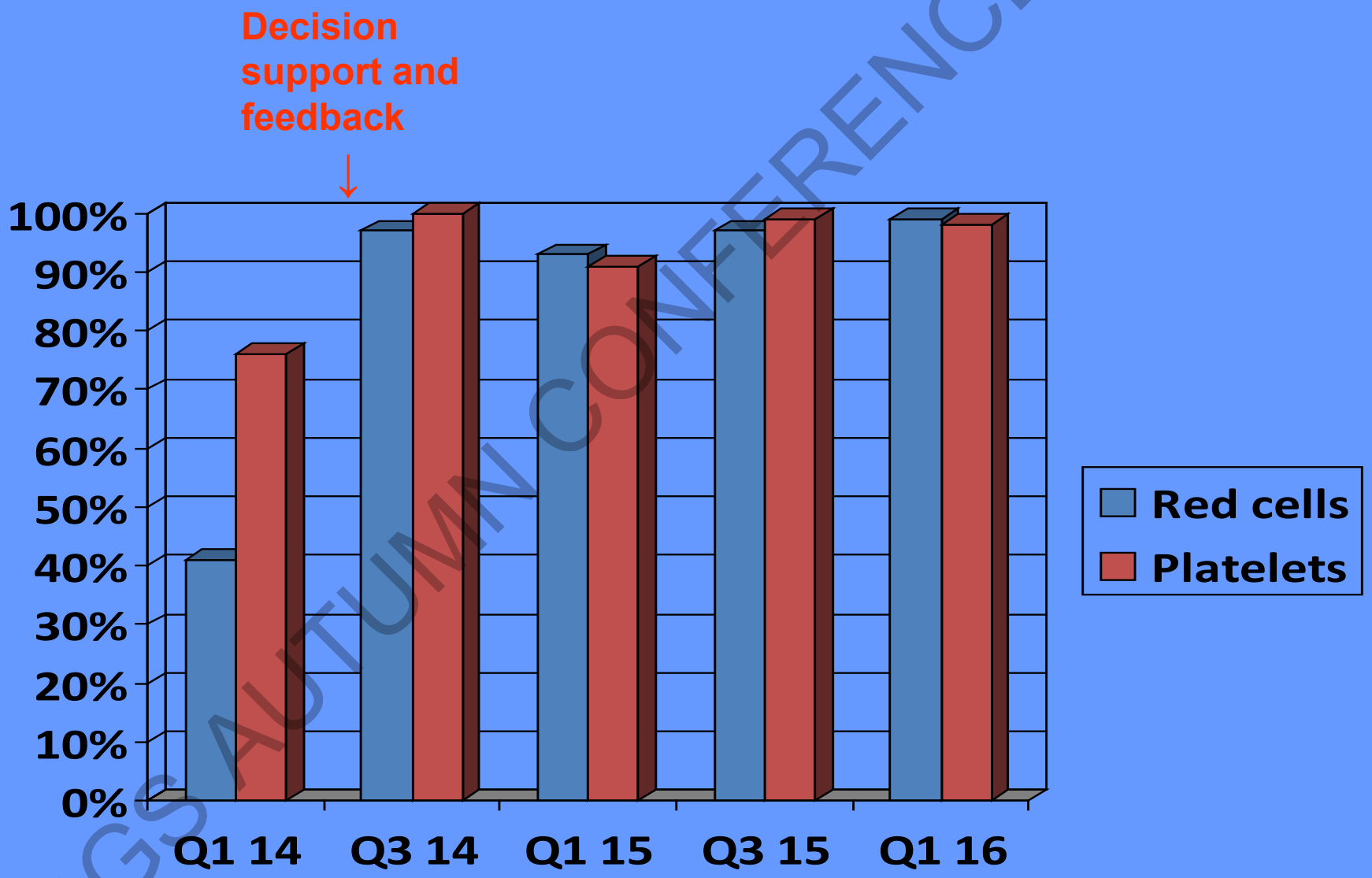


2 Select a reason for transfusion

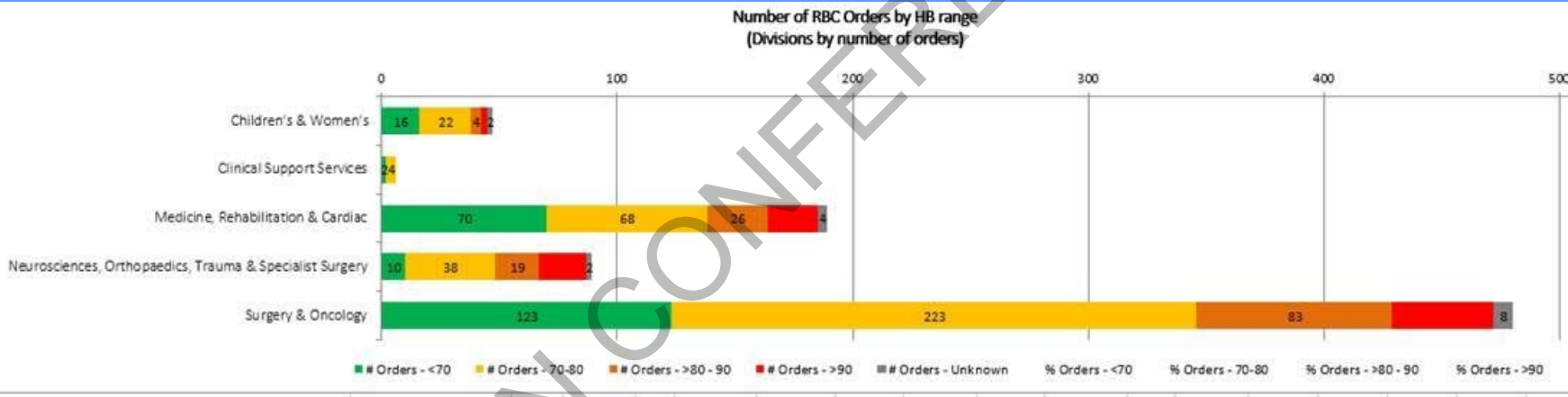
3 Alert if transfusion not justified



Compliance with agreed transfusion triggers in haematology improved from <50% to >90%



Feedback of data to clinical teams
(Red cell usage by OUH Division)



Order_Month	01/10/2015									
TransfCriterialnclusion	Hb									
	Hb Prior to Order									
	# Orders					% Orders				
Div/Direc/Spec	<70	70-80	>80 - 90	>90	Unknown	<70	70-80	>80 - 90	>90	Unknown
Children's & Women's	16	22	4	3	2	34.04%	46.81%	8.51%	6.38%	4.26%
Clinical Support Services	2	4				33.33%	66.67%	0.00%	0.00%	0.00%
Medicine, Rehabilitation & Cardiac	70	68	26	21	4	37.04%	35.98%	13.76%	11.11%	2.12%
Neurosciences, Orthopaedics, Trauma & Specialist Surgery	10	38	19	20	2	11.24%	42.70%	21.35%	22.47%	2.25%
Surgery & Oncology	123	223	83	43	8	25.63%	46.46%	17.29%	8.96%	1.67%
Grand Total	221	355	132	87	16	27.25%	43.77%	16.28%	10.73%	1.97%

Feedback of data to clinical teams
(Red cell usage by OUH Specialty)

Reduction in OUH blood use and cost savings 2017

	2016 (units)	2017 (units)	% OUHT change	% national change	Cost reduction
Red Cells	21,511	20,058	-6.7%	-5.3	**£180,840**
Platelets	3803	3725	-2.1%	-0.5	**£13,898**
FFP	4397	4452	+1.3%	-4.0	**-£1,565**
Cryo	598	469	-21.6%	+4.2	**£4,080**
Total cost reduction					**£197,253**

Specific transfusion issues in geriatrics

1. Management of acute anaemia: is there a need for trials of liberal or restrictive red cell transfusion?
2. Management of chronic anaemia: what are the most effective algorithms for investigation and management?
3. How best to avoid the need for intermittent or regular transfusion?
4. What are the optimal management of bleeding due to over-anticoagulation or other disorders of haemostasis?

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Implementation team: Barbara Cripps, Alan Cook, Edward Fraser, Rachel Parker