Clinical Use of Blood
The AIM II Trial

Sue Cotton

Blood Stocks Management Scheme

27/01/12

Dynamic Blood, East Midlands RTC Conference.

Presentation

- Setting the Scene
- Inventory Management
- AIM II – what is it?
- Trial of AIM II
- Benefits of AIM II
- Summary

Setting the Scene

- Blood transfusion is an essential part of modern health care.
- Goodwill of voluntary donors
- Supply must meet demand
- Demand is difficult to predict
- It would be great to have detailed intelligence on ‘where blood goes’

How can we find out how blood is being used at the moment?

National Comparative Audit of Blood Transfusion

National Comparative Audit of Blood Transfusion

NHS Blood and Transplant

2010 Re-audit of th
Platelets in Haema

April 2011

National Comparative Audit of the Use of Fresh Frozen Plasma

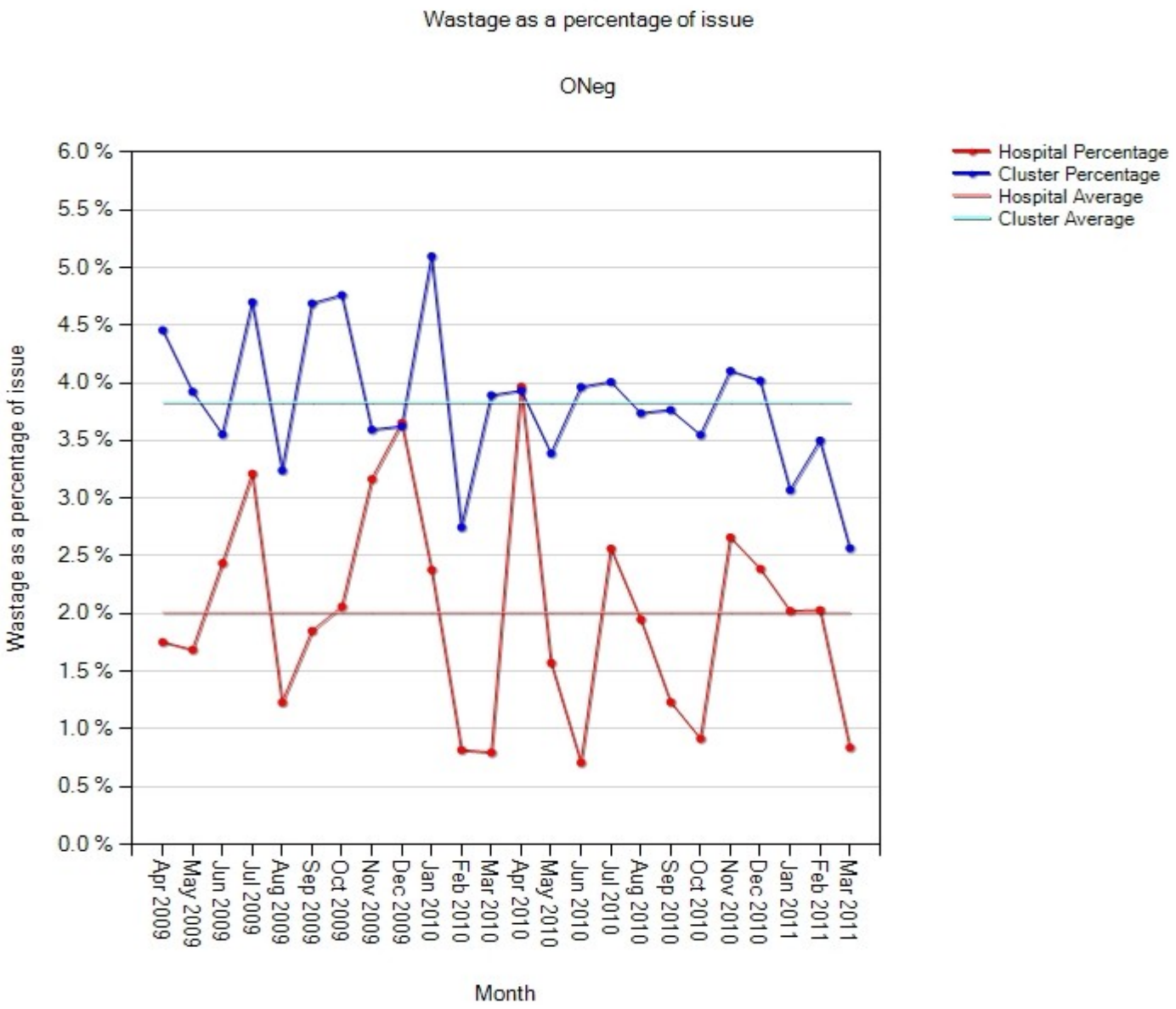
Full Report

February 2009

NHS Blood Stocks Management Scheme

Blood Stocks Management Scheme

- Intelligence on blood inventory management gathered from across the blood supply chain.
- Stock and wastage levels of red cells
- Wastage levels of platelets
- Benchmarking
- Transparency of data
- Significant improvements in inventory management


Wastage as a percentage of issue
ONeg
Hospital Percentage
Cluster Percentage
Hospital Average
Cluster Average
Wastage as a percentage of issue
6.0 %
5.5 %
5.0 %
4.5 %
4.0 %
3.5 %
3.0 %
2.5 %
2.0 %
1.5 %
1.0 %
0.5 %
0.0 %
Apr 2009
May 2009
Jun 2009
Jul 2009
Aug 2009
Sep 2009
Oct 2009
Nov 2009
Dec 2009
Jan 2010
Feb 2010
Mar 2010
Apr 2010
May 2010
Jun 2010
Jul 2010
Aug 2010
Sep 2010
Oct 2010
Nov 2010
Dec 2010
Jan 2011
Feb 2011
Mar 2011
Month

RTC Quarterly Hospital RBC/PLT Issue Report

South West RTC — Regional Blood Group Distribution Data **

O Pos	O Neg	A Pos	A Neg	B Pos	B Neg	AB Pos	AB Neg
36.9%	7.9%	34.8%	7.7%	7.7%	1.5%	2.8%	0.6%

Issues from NHSBT for :- 2010/11 Q2

Hospital Details	Red Cell Issues from NHSBT Centres										RBC Stock Move		Issues	PLT Stock Move	
Hospital Name	O Pos	O Neg	A Pos	A Neg	B Pos	B Neg	AB Pos	AB Neg	All RBC's	% O Neg	Corrected Total		All PLT's	Corrected Total	
The Great Western Hospital	712	219	736	199	102	71	49	27	2,115	10.4%			245		
Frenchay Hospital	539	170	595	161	127	18	49	0	1,659	10.2%			86		
Bristol Royal Infirmary	1,392	395	1,367	352	333	70	90	32	4,031	9.8%	4,032	Move	1,146		
Taunton and Somerset Hospital	1,174	301	965	304	215	81	67	32	3,139	9.6%	3,135	Move	203		
Gloucester Royal Hospital	889	202	742	179	108	44	34	18	2,216	9.1%			138		
Royal Devon and Exeter Hospital	1,532	326	1,306	255	293	92	82	34	3,920	8.3%	3,919	Move	375		
Cheltenham General Hospital	729	172	806	159	112	53	41	17	2,089	8.2%	2,133	Move	259		
Southmead Hospital	861	171	677	113	162	42	43	9	2,078	8.2%			147		
Royal Bournemouth Hospital	893	183	720	147	157	38	72	34	2,244	8.2%			344		
Weston General Hospital	477	104	430	129	86	46	27	18	1,317	7.9%			38		
Yeovil District Hospital	447	86	371	72	121	19	0	0	1,116	7.7%			37		
RTC Summary Data	16,258	4,603	15,008	3,813	2,942	942	855	353	44,774	13.9%			4,839		

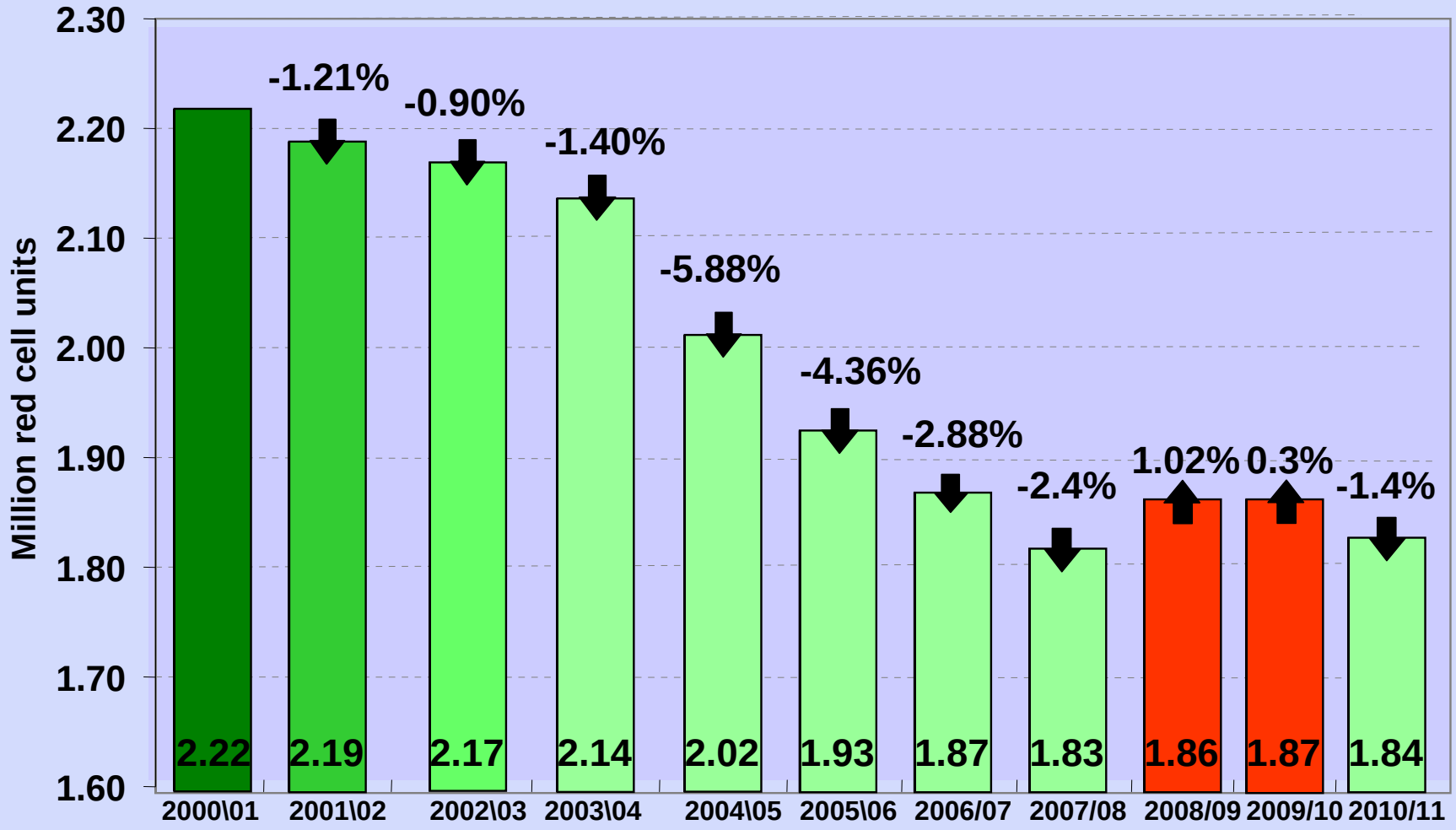
'Appropriate Inventory Management' (AIM) Overview

- Phase I (Module1)
  - BSMS source code provided by NHSBT
  - Collaboration between NHSBT/ America's Blood Centers (ABC)
  - American name: AIM I (Appropriate Inventory Management – Module I)
- Phase II (Module 2)
  - Allows for vein to vein monitoring of blood components from donation to the patient at the hospital
  - Blood utilisation management requires patient level transfusion data in order to determine meaningful and appropriate use

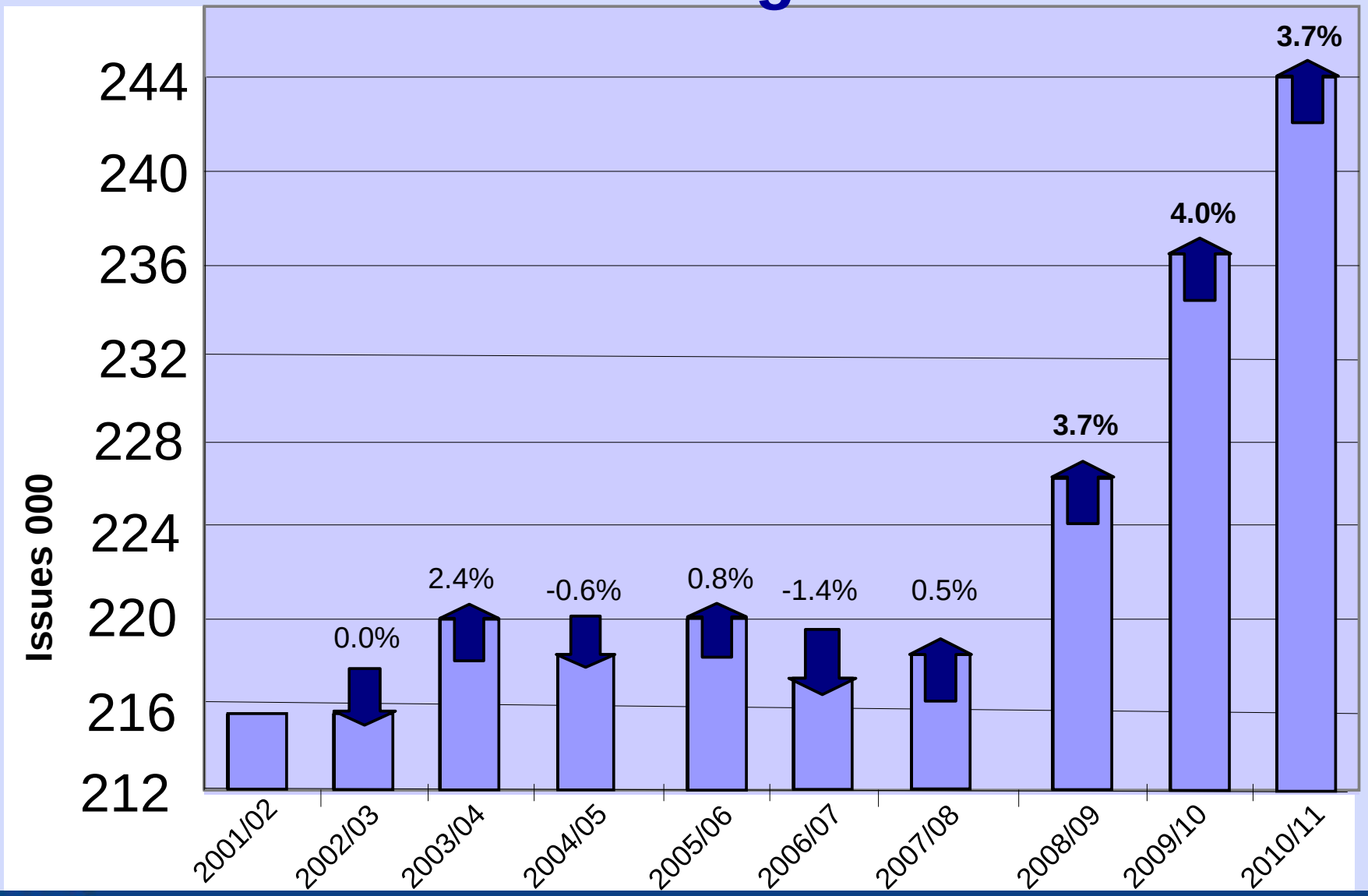
Goals for AIM

- Create an inclusive approach to blood management by aligning supply with demand to ensure patient transfusion needs are met
- Assist hospitals in complying with metric driven standards
- AIM is used to reduce the overall cost of blood by tracking Key Performance Indicators (KPIs):
  - Reduce unnecessary transfusion by providing reports with national (and international) benchmarking to reveal evidence based best practice

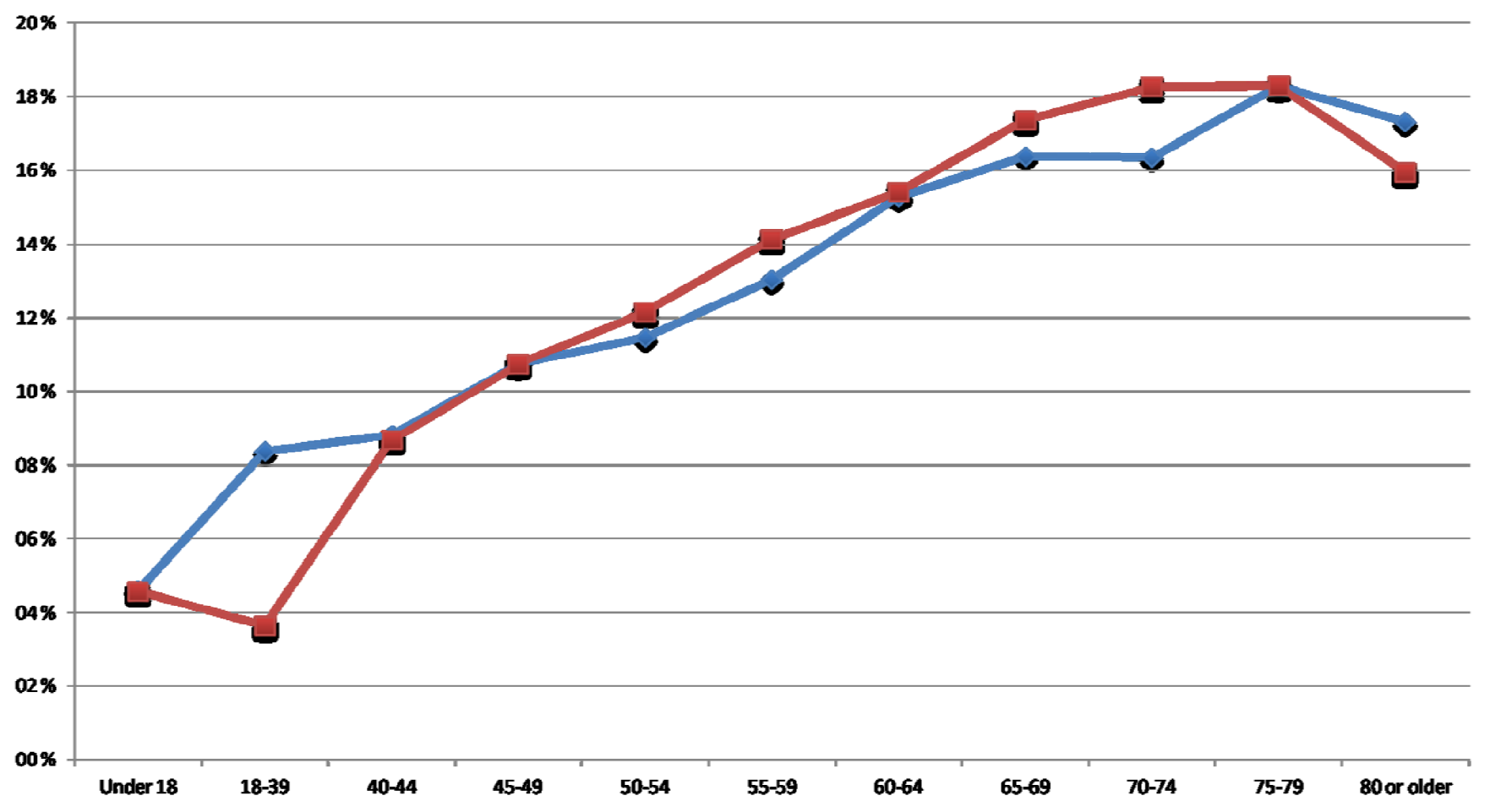
Red Cell Demand in England & N Wales



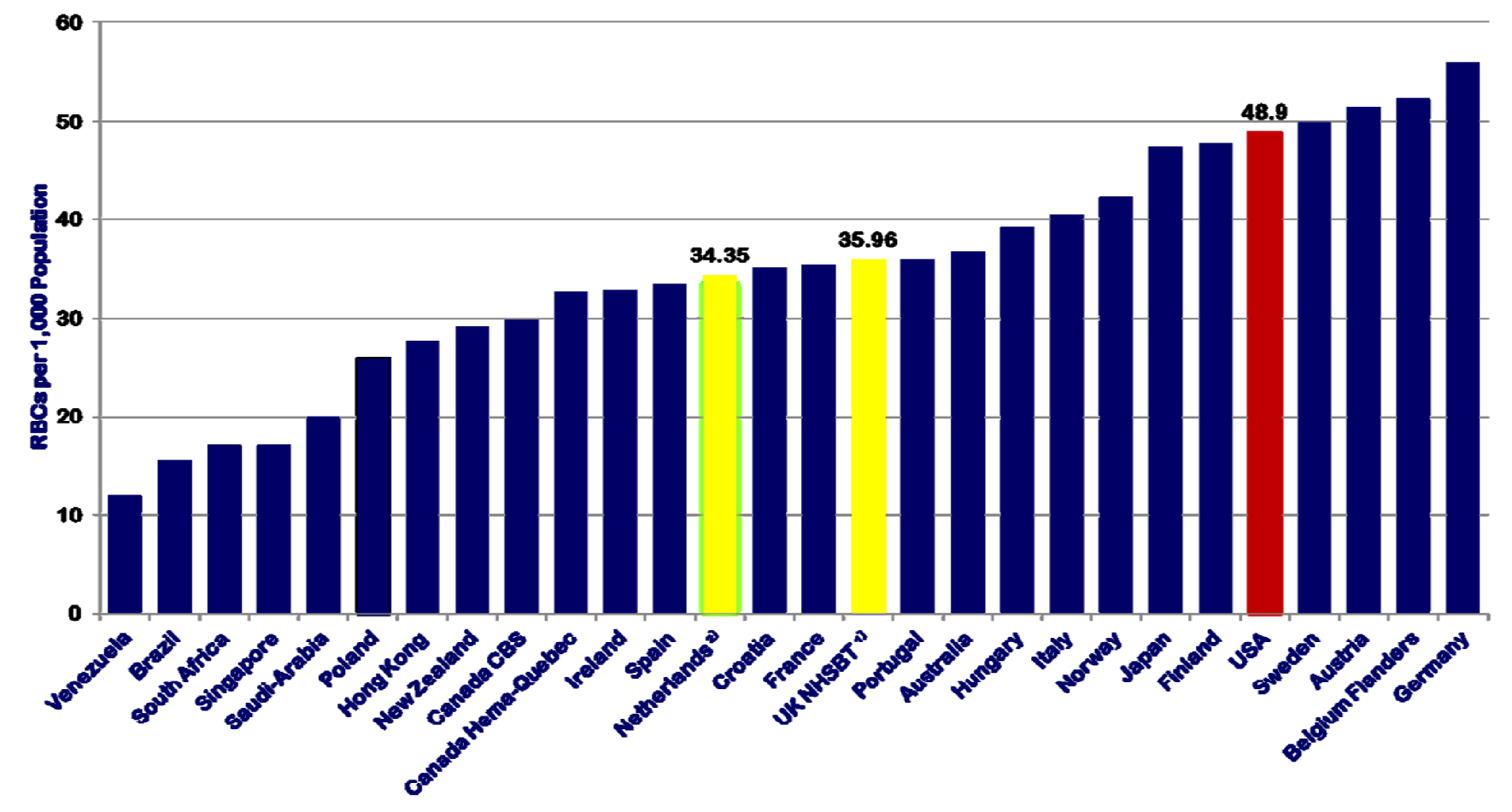
Platelet Demand in England & N. Wales



AIM: Distribution of Transfused Patients by Age Group, Gender



Global Red Cell Utilization Rates: 2008-09



Source: D Devine et al.: International Forum/Inventory Management, Vox Sanguinis 2009

LIMS data related to transfusion episode

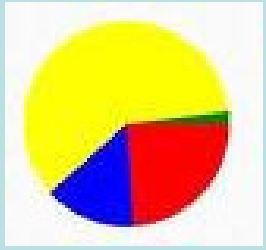
PAS data related to length of stay, consultant, specialty

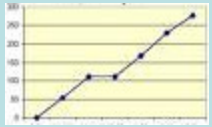
PAS coded data related to transfusion episode (ICD 10 diagnosis code, OPCS4 procedure code)

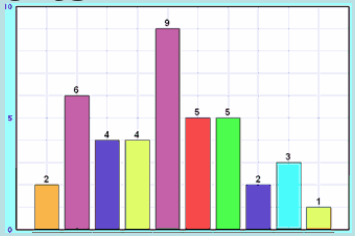
Data mining software extracts relevant data (no patient identifiable features)

Datawarehouse hosted by ABC (in trial)

Analysis and reports







AIM II – The need for data

- Dictionary of data elements required provided to hospital.
- Hospitals extract data around the transfusion episode from hospital databases and send to a data warehouse.
- Data can be used to generate reports for both blood providers and blood users.

Data Elements for Blood Utilization Analysis

DATA ELEMENT -	TRANSF	ID	DOA	DOD	DQTR	LOS	AGE_CATS	SEX	MSDRG	PAYOR	VERIFIED_D_T	C_EVENT_DISP	RESULT_VAL	PR_PROD_DISP	PROD_NBR	SUB_NBR	PROD_EXP_DATE
Definition	transfusion	encrypted patient ID #	date of admiss										clinical event result (laboratory ciated	fused	Donation Identification Number-unit number	ISBT 128 or codabar Product code	Expiration date of the blood product
Value	alpha (YES, NO)	alphanumeric	(MC												a/ numeric	alpha/ numeric	Date (Month/Day/Year)
Required	yes	yes	yes												Yes	Yes	No
Comments	YES or NO for each record for each unique ID	Patient records should not include unique identifiers to ensure HIPAA compliance. Repeats for each record for a unique patient	Ex: 06/16/2009	Ex: 06/16/2009	Ex: CY 09 - Qtr 3				related to patient at the time of discharge		Ex: 09/11/09 11:49		y results associated with product groups - dashboards: 1, 2=Hgb; 3,4=INR; 5,6=Fibrinogen; 7,8,and 9=Platelet Count	Transfused product group when C_EVENT_DISP = TRANSFUSED AIM Populates this field from product code data	Used for hospital review of records	Provided for standardized product mapping	Provided to evaluate outcomes based upon age of component transfused

- Transfusion yes or no?
- Patient ID (encrypted)
- Date of admission and discharge
- Year of birth
- Gender
- Healthcare Resource Group (HRG)
- Date and time of transfusion
- Transfused component
- Pre transfusion lab test result
- Donation number and product code
- Expiry date

Data Elements for Transfusion Outcome Evaluations

DATA ELEMENT -	MORT_FLAG	ORD_PHY	PHY_SVCLN	POSTOP_INFECT	DVT	SIGN_SYMP	TRANS_REACT	TXRX_SEVERITY	TXRX_IMPUTABILITY	POSTTX_INFECTION	POSTTX_INFIMPUT	POSTTX_INFSEVERITY	Re_ADMT
Definition	mortality flag	Ordering Physician	Ordering Physician Service Line	post-op infecti flag						tions thought to sfusion d	Post transfusion infection imputability	Post-transfusion infection severity	Re-admissions within 30 days
Value	YES NO (disposition YES at discharge = death)	Alpha Numeric	0 = None Selected, 2 = Medical Services, 3 = Neonatal Services, 4 = Surgical Services, 5 = Bone Marrow Transplant Services, 6 = Obstetric Services, 7 = Solid Organ Transplant Services, 8 = Cardiology Services, 9 = Neurological Services, 10 = Orthopedic Services, 11= Nephrology Services, 12 = Hematology/Oncology Services, 13 = Radiology Services, 14 = Emergency Services, 15 = Intensive Care Unit Services	YES NO (POA)	YES NO (POA)	Hypoxe... in blood pressure, Jaundice, Nausea/Vomiting, Olilguria, Other Skin Rash, Pain, Pruritis, Shock, Shortness of Breath, Urticaria	AHTR, DHTR, DSTR, Hypotensive, FNHTR, PTP, TACO, TAD, GVHD, TRALI,	Grade 1, Grade 2, Grade 3, Grade 4	Definite, Probable, Possible, Doubtful, Ruled Out, or Not Determined	Bacterial, Viral, Parasitic, or Other	Definite, Probable, Possible, Doubtful, Ruled Out, or Not Determined	Grade 1, Grade 2, Grade 3, Grade 4	alpha (YES, NO)
Required	yes	No	No	no	no	no	no	no	no	no	no	no	no
Comments		Physician ordering the transfusion as opposed to the XM-CPOE	As defined in AIM v1.1- To capture the hospital cost center or specialty area of the physician associated with the transfusion			As defined by the CDC Hemovigilance program	As defined by the CDC Hemovigilance program	As defined by the CDC Hemovigilance program	As defined by the CDC Hemovigilance program	As defined by the CDC Hemovigilance program	As defined by the CDC Hemovigilance program	As defined by the CDC Hemovigilance program	

- Mortality Flag
- Ordering physician
- Directorate

Trial of AIM II in England

- Evaluate the AIM II system functionality, assessing the feasibility of using system to collect information on blood usage
- Trial in collaboration with 4 hospitals
- Present overview of system to hospital teams to enable them to understand the resources and IT capability required.
- Work with hospitals to establish data extraction routines
- Hospitals send data to data warehouse
- Benchmarking reports provided to hospitals

AIM Hospital Profile

Hospital Name:

Hospital System Name (if applicable):

Supplied by:

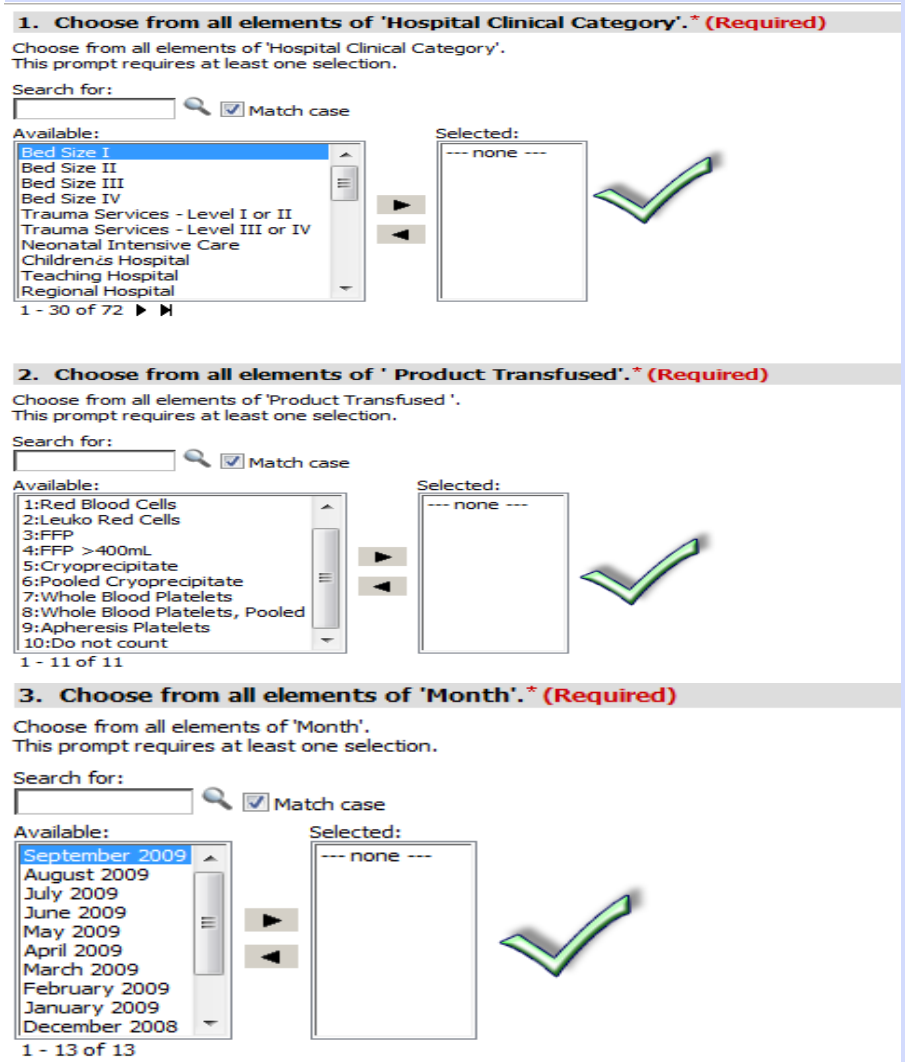
Hospital Clinical Categories

This information will be entered onto AIM so that each hospital can compare data sets with hospitals having a similar profile.
√ to add (a tick indicates hospital belongs to a category).
Leave blank if category does not apply to hospital.

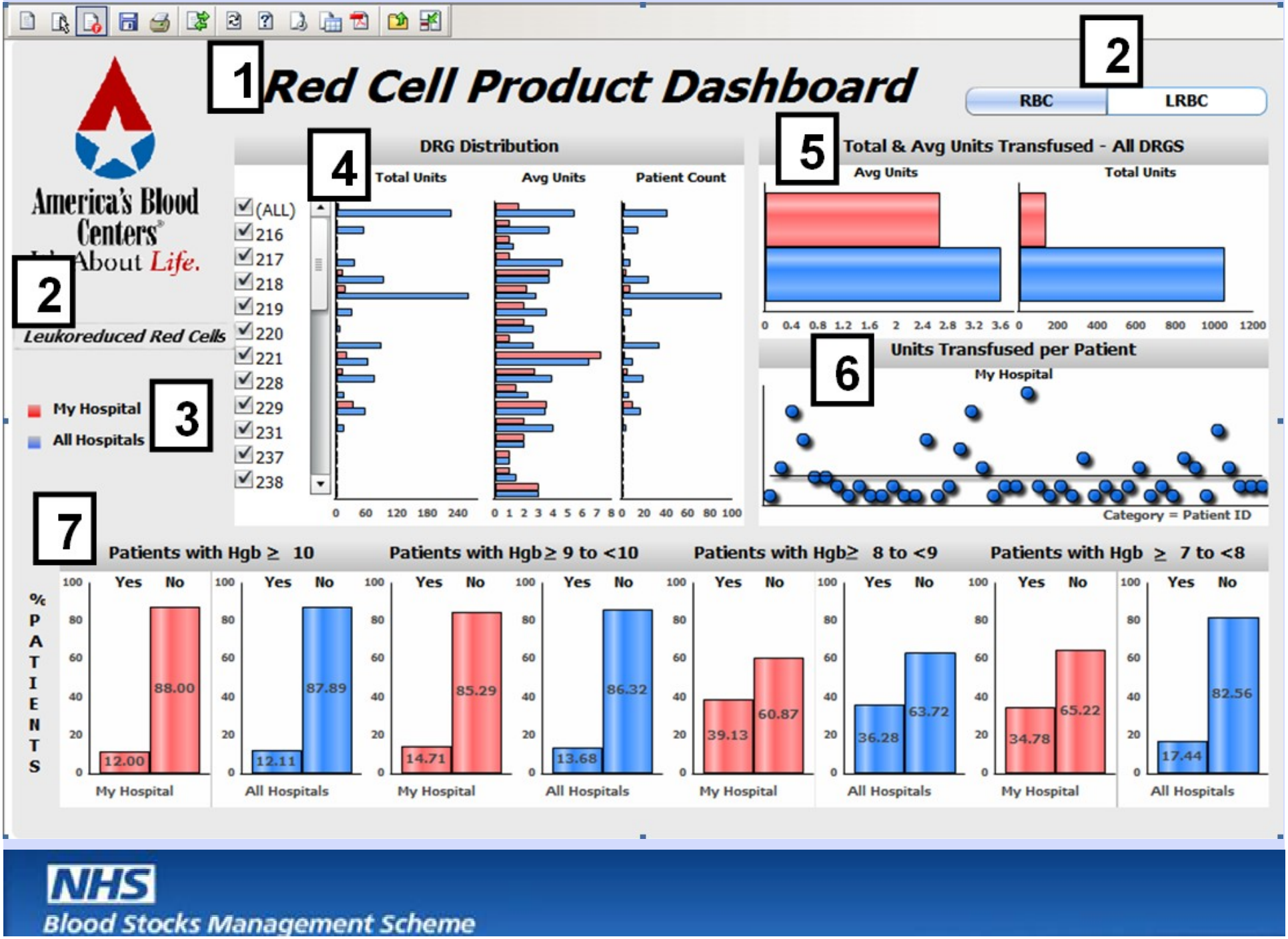
Category	Details	Please √
Bed Size I	≤100 patient beds available	
Bed Size II	>100 ≤300 patient beds available	
Bed Size III	>300 ≤ 500 patient beds available	
Bed Size IV	>500 patient beds available	✓
Trauma Services	Major Trauma Centre	✓
Trauma Services	24 hour Accident and Emergency facility. (Minor injury units are not counted as an Accident and Emergency facility)	
Neonatal Intensive Care	Level II or III (As defined by the British Association of Perinatal Medicine)	
Children's Hospital	Specialises in paediatric services	
Teaching Hospital	Medical school is either attached or affiliated	✓
District General Hospital	District General Hospital	
Private Hospital	Independent facility	
Cardiac Services	Cardiothoracic surgical procedures provided	
Hematology/Oncology Services	Cancer patient care provided	✓
Renal Services	Dialysis provided	
Neurological Services	Neurological surgical procedures provided	
Obstetric Services	Women's health services provided	
Orthopaedic Services	Orthopaedic surgery provided	✓
Blood Conservation Program	Facility has implemented a blood conservation program	
Ambulatory/Day Surgery	Provides outpatient surgery services	
Electronic Crossmatch	Transfusion Service uses electronic crossmatches	

Intra/Post-Operative Cell Salvage	Cell salvage utilized routinely	
Transplant, Heart/Lung	Facility provides heart/lung transplants	
Transplant, Liver	Facility provides liver transplants	
Transplant, Bone Marrow	Facility provides bone marrow transplants	✓
Transplant, Pancreas	Facility provides pancreas transplants	
Burn Care Services	Burn injury services provided	
Supply Crossmatched	Provide blood to other hospitals that is crossmatched	✓
Zone 1	0-15 miles from supplier (category assigned by BSMS)	
Zone 2	16-30 miles from supplier (category assigned by BSMS)	
Zone 3	31-45 miles from supplier (category assigned by BSMS)	
Zone 4	46-90 miles from supplier (category assigned by BSMS)	
Zone 5	91-120 miles from supplier (category assigned by BSMS)	
Zone 6	>120 miles from supplier (category assigned by BSMS)	
Annualized Platelet Usage (count random pools as dose equivalent)	Very High (>401), High (201-400), Moderate, (51-200) Low (11-50), Very Low (0-10) (category assigned by BSMS)	
Annualized Red Blood Cell Usage (count all red cell products)	Very High (>4001), High (1601-4000), Moderate (801-1600), Low (251-800), Very Low (0-250) (category assigned by BSMS)	

AIM II -Benchmarking



❖***Benchmarking based upon clinical categories the user chooses***


1
Red Cell Product Dashboard
2
RBC
LRBC
America's Blood Centers
About Life.
2
Leukoreduced Red Cells
3
My Hospital
All Hospitals
4
DRG Distribution
Total Units
Avg Units
Patient Count
(ALL)
216
217
218
219
220
221
228
229
231
237
238
0 60 120 180 240
0 1 2 3 4 5 6 7 8
0 20 40 60 80 100
5
Total & Avg Units Transfused - All DRGS
Avg Units
Total Units
0 0.4 0.8 1.2 1.6 2 2.4 2.8 3.2 3.6
0 200 400 600 800 1000 1200
6
Units Transfused per Patient
My Hospital
Category = Patient ID
7
Patients with Hgb ≥ 10
Patients with Hgb ≥ 9 to <10
Patients with Hgb ≥ 8 to <9
Patients with Hgb ≥ 7 to <8
% PATIENTS
Yes
No
12.00
88.00
My Hospital
12.11
87.89
All Hospitals
14.71
85.29
My Hospital
13.68
86.32
All Hospitals
39.13
60.87
My Hospital
36.28
63.72
All Hospitals
34.78
65.22
My Hospital
17.44
82.56
All Hospitals
NHS
Blood Stocks Management Scheme

Platelet Dashboard

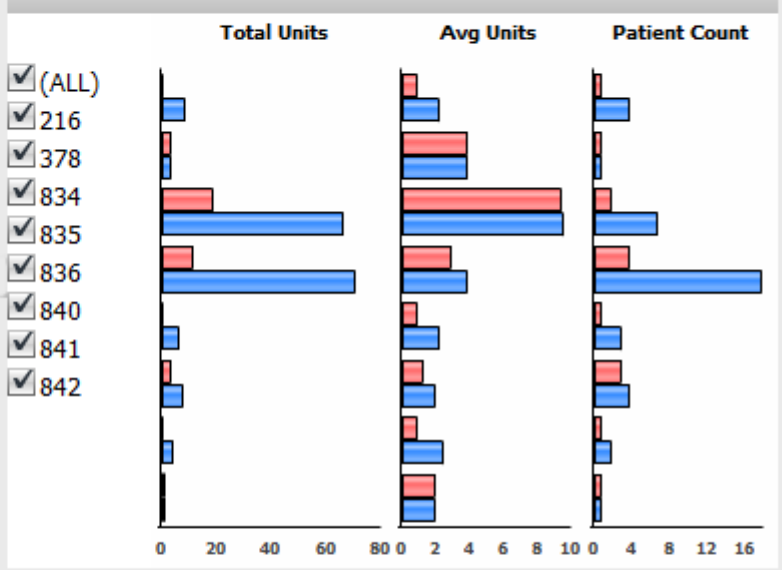
Whole Blood | Pooled Whole Blood | Apheresis Platelet

America's Blood Centers®
It's About Life.

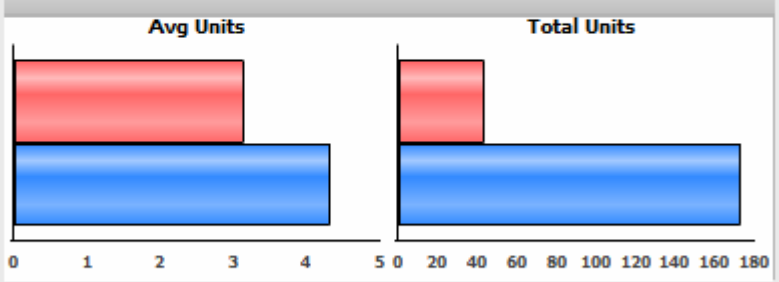
Apheresis Platelet

My Hospital
ALL Hospital

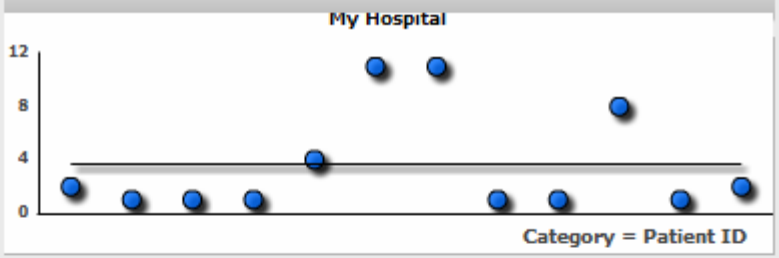
DRG Distribution



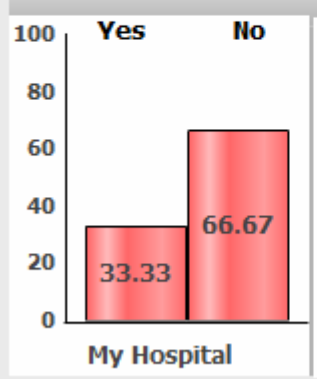
Total & Avg Units Transfused All DRGS

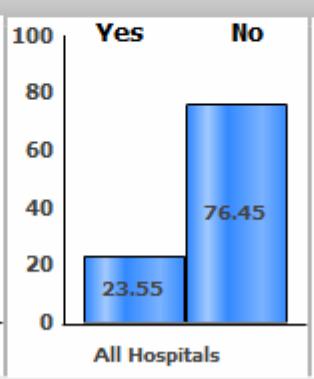


Units Transfused per Patient

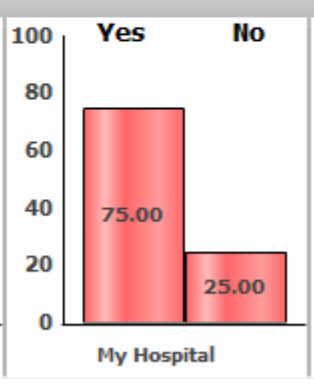


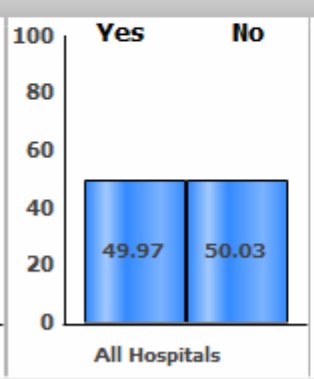
Patients with Plt count < 10K



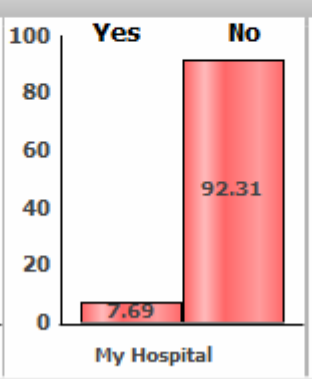


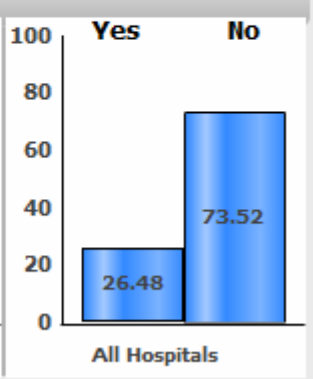
Patients with Plt count ≥ 10K to 50K





Patients with Plt count ≥ 50K





NHS
Blood Stocks Management Scheme

FFP Product Dashboard

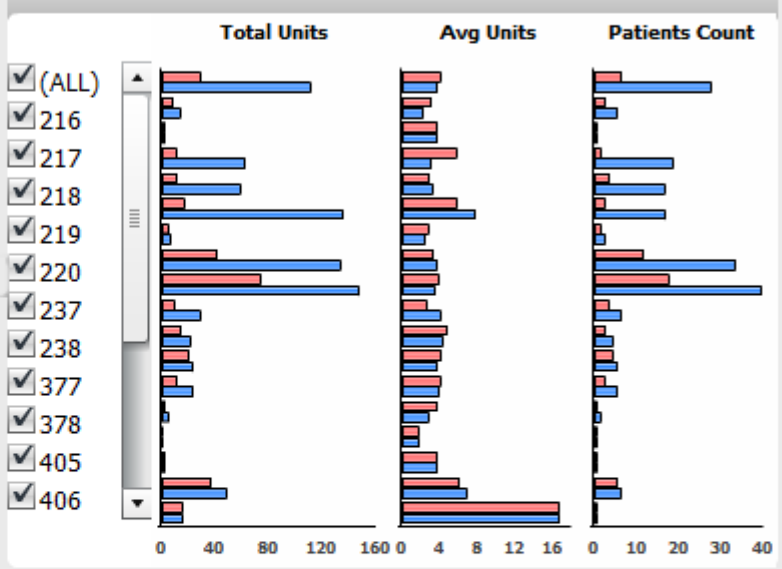
FFP | FFP > 400mL

America's Blood Centers®
It's About Life.

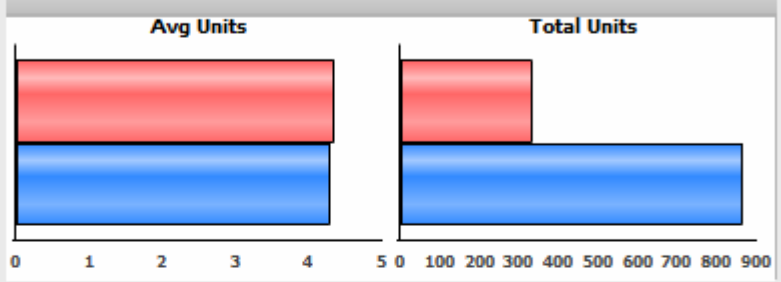
FFP

My Hospital
All Hospitals

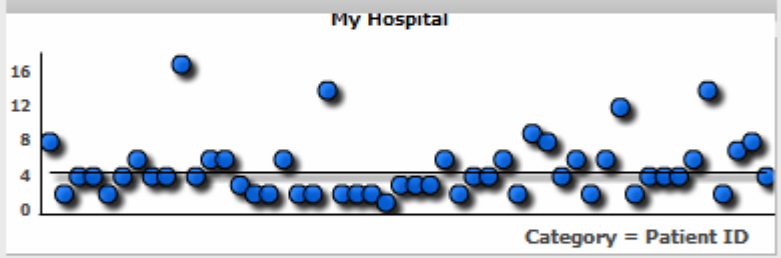
DRG Distribution



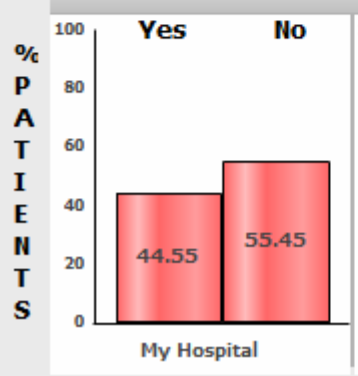
Total & Avg Units Transfused - All DRGS

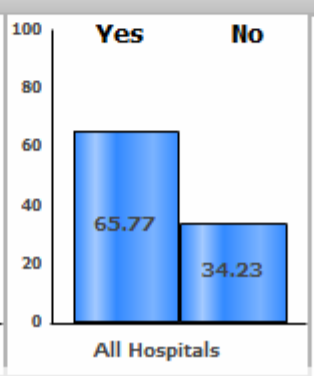


Units Transfused per Patient

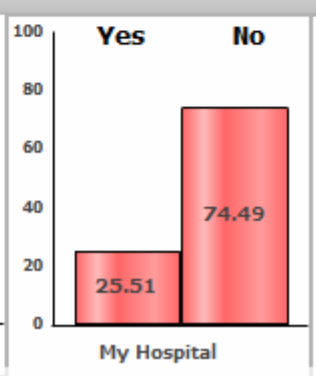


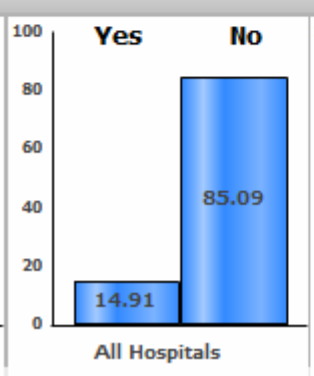
Patients with INR < 1.5



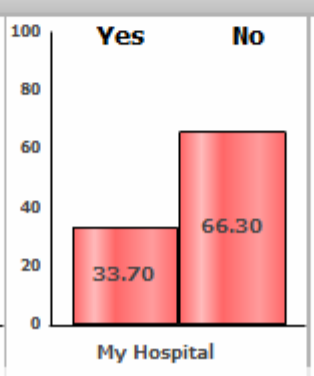


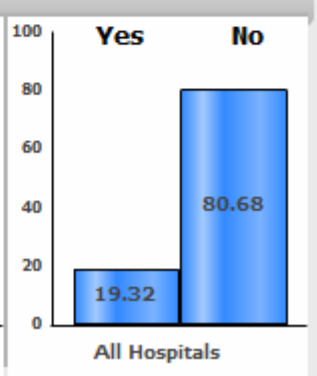
Patients with INR ≥ 1.5 to 2.0





Patients with INR ≥ 2.0





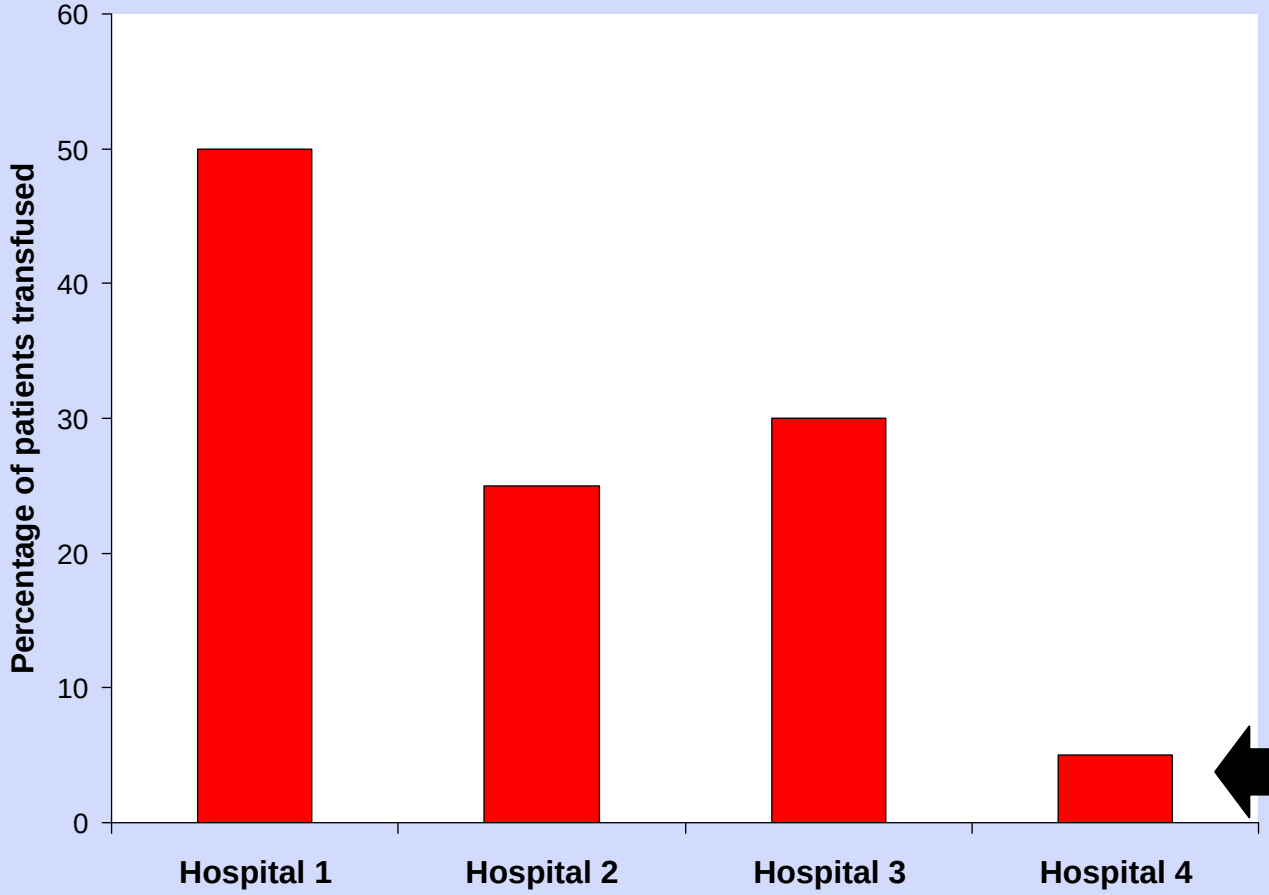
NHS
Blood Stocks Management Scheme

Functional Outcomes in Cardiovascular Patients Undergoing Surgical Hip Fracture Repair (FOCUS) Trial

Randomized clinical trial designed to test the hypothesis that higher blood transfusion threshold improves functional recovery and reduces morbidity and mortality.

Outcome of this trial targets a more conservative 8.0g/dL transfusion trigger.

Comparison of use of red cells in primary hip replacement



This hospital has:
- a pre op anaemia management pathway
- uses IV tranexamic acid to cover surgery
- has a strict post op transfusion trigger

Figure 1. Observed Variation in Hospital-Specific Transfusion Rates for Primary Isolated CABG Surgery With Cardiopulmonary Bypass During 2008 (N = 798 Sites)

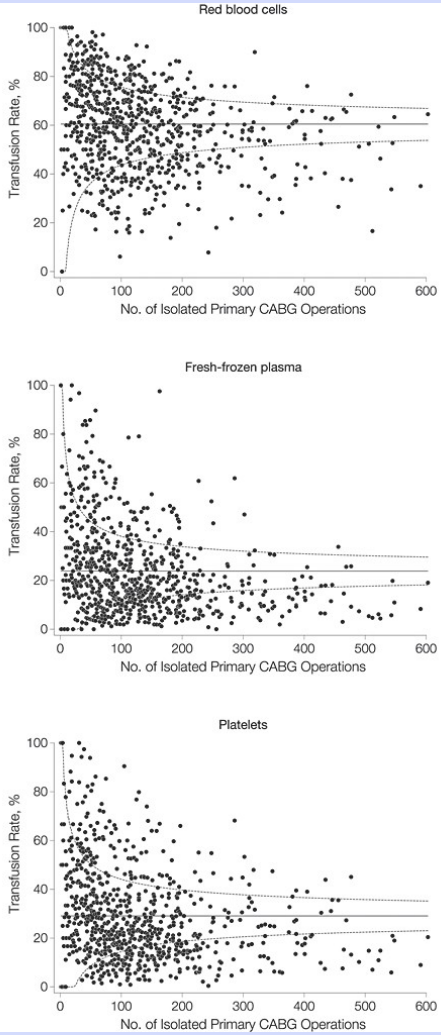


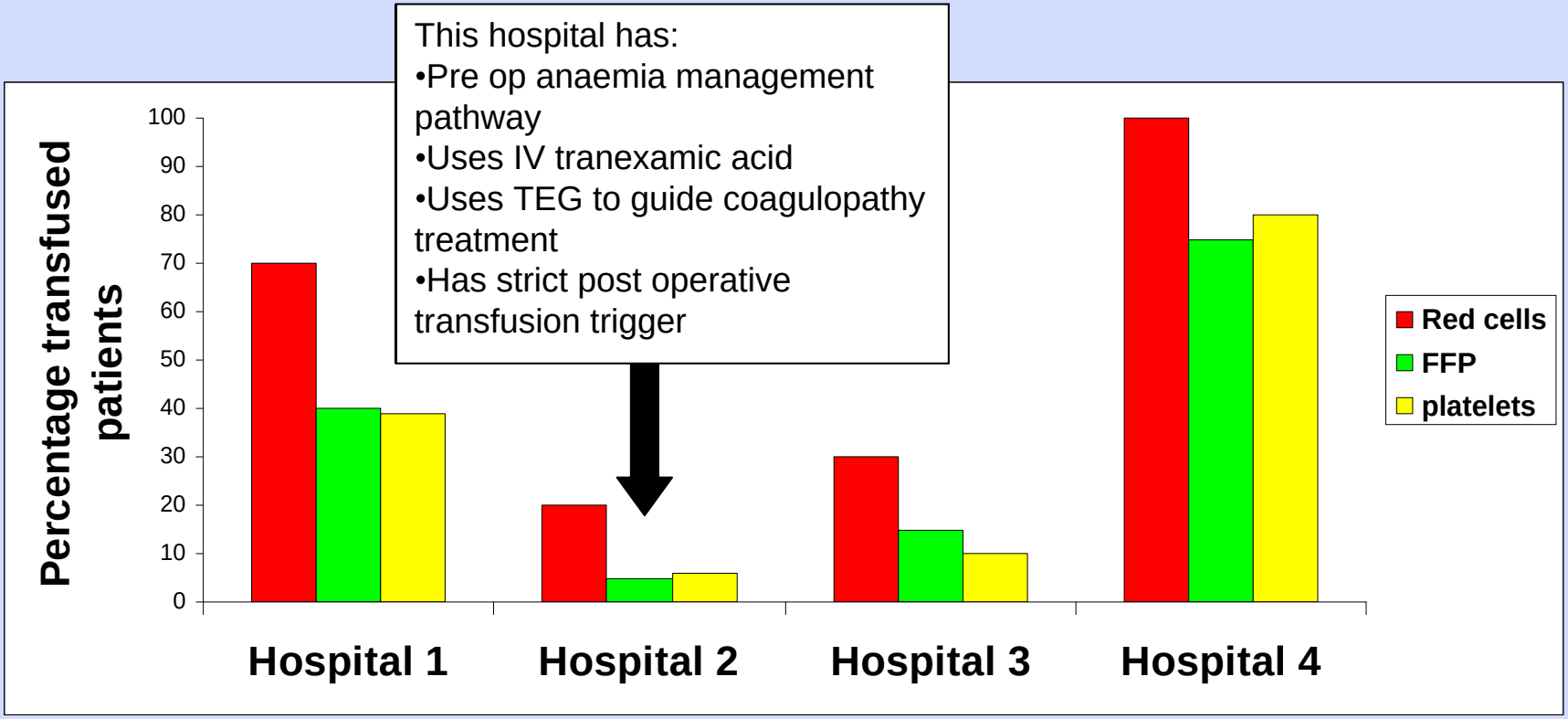
Figure 1. Observed Variation in Hospital–Specific Transfusion Rates for Primary Isolated CABG Surgery With Cardiopulmonary Bypass During 2008 (N = 798 Sites)

CABG indicates coronary artery bypass graft. Each solid circle represents a unique hospital, with the observed transfusion rate percentages for that hospital (red blood cells, fresh–frozen plasma, and platelets) plotted against the hospital's 2008 volume of isolated primary CABG operations. The solid line indicates the overall mean transfusion rate across all hospitals. The dashed lines indicate the upper and lower 99.9% prediction limits based on the binomial distribution.

Bennett-Guerrero, E. et al. JAMA 2010;304:1568-1575

JAMA

Blood and blood component use in coronary artery bypass surgery



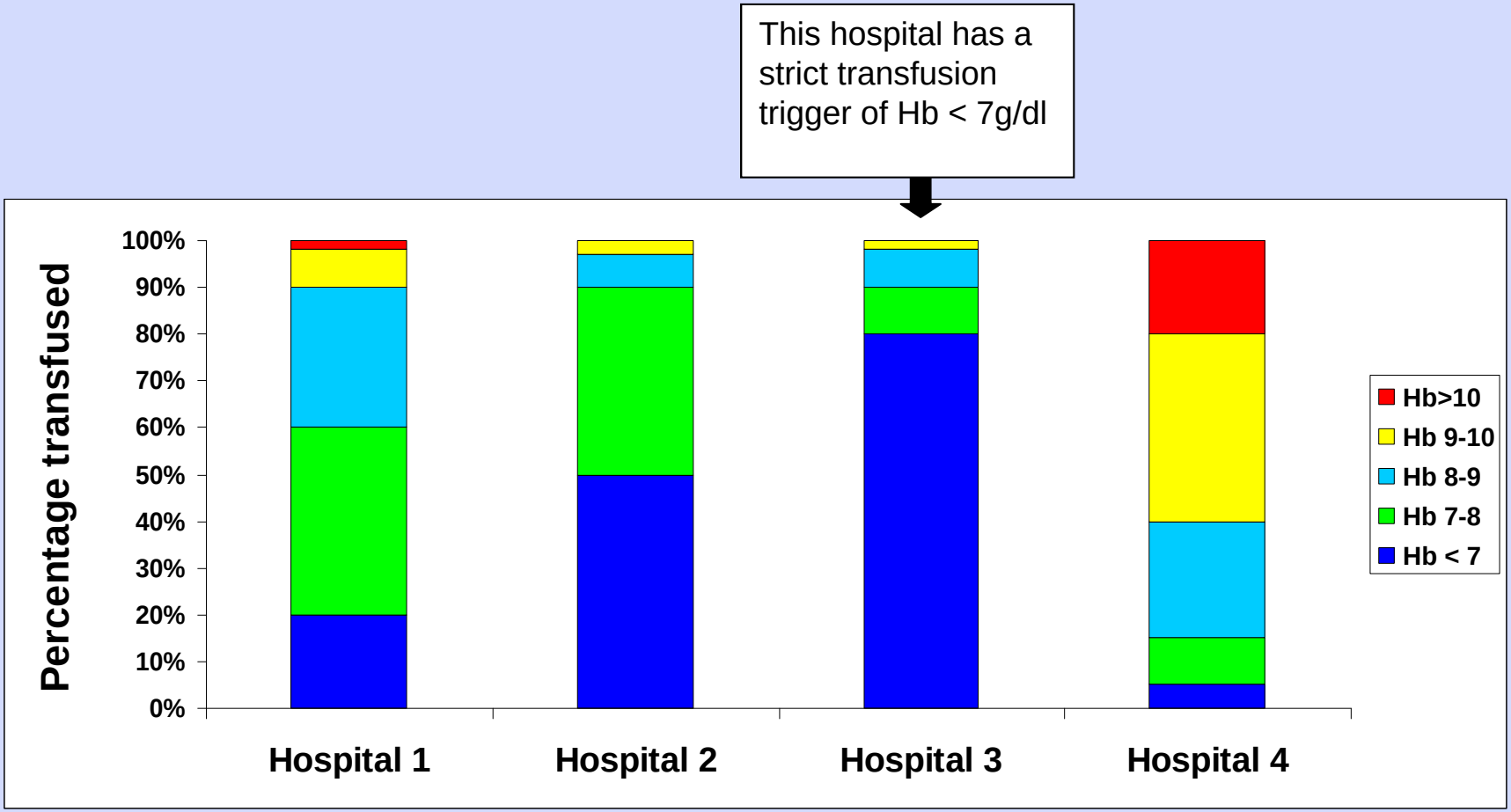
Transfusion Requirements in Critically Ill (TRICC)

Outcome:

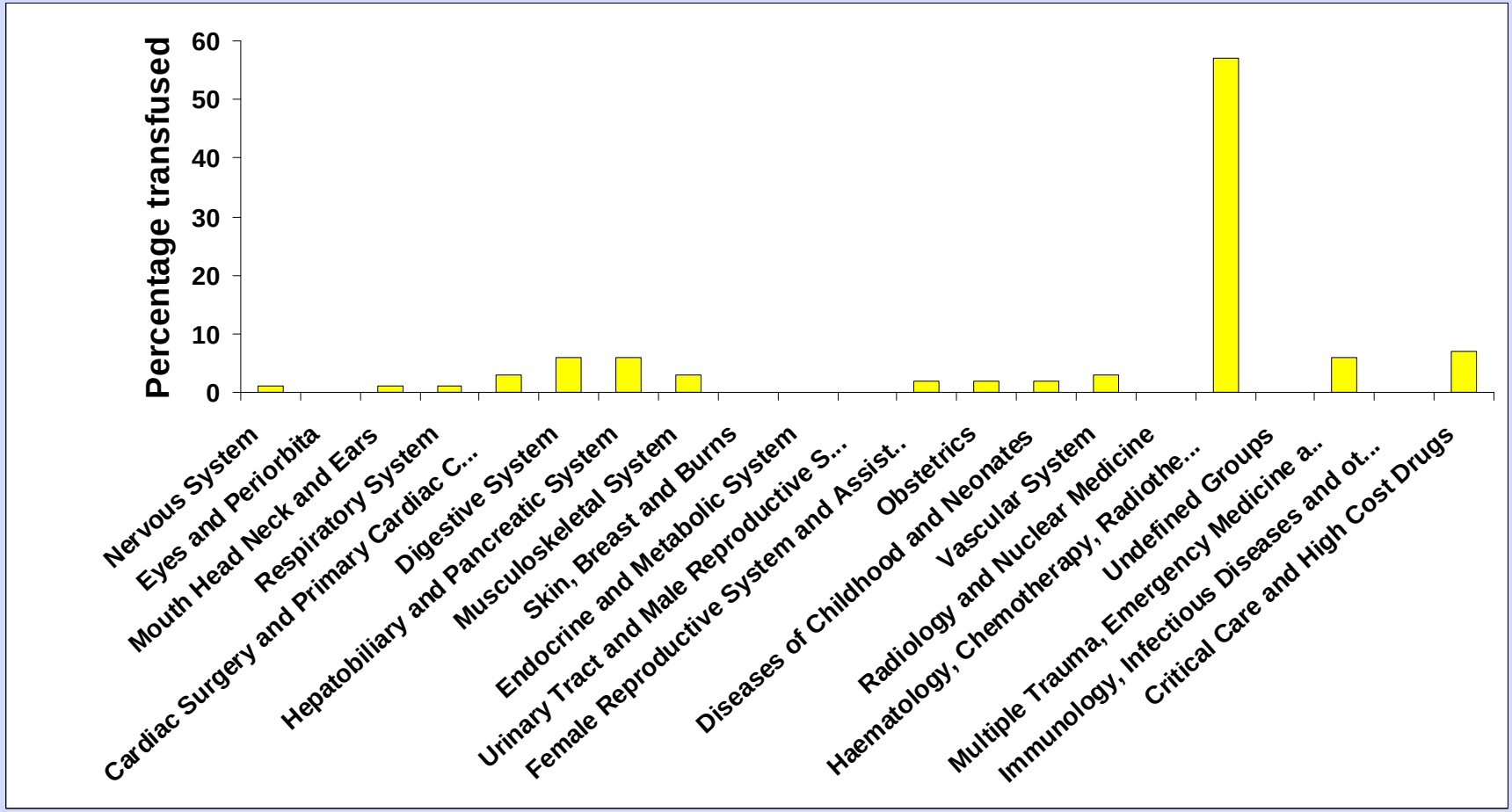
in the absence of bleeding, this group recommended 7.0g/dL as the hemoglobin trigger for best patient outcome.

Controversies in RBC Transfusion in the Critically Ill, Paul C. Hebert, et al April, 2007 (Abstract)

Red cell transfusion on ICU

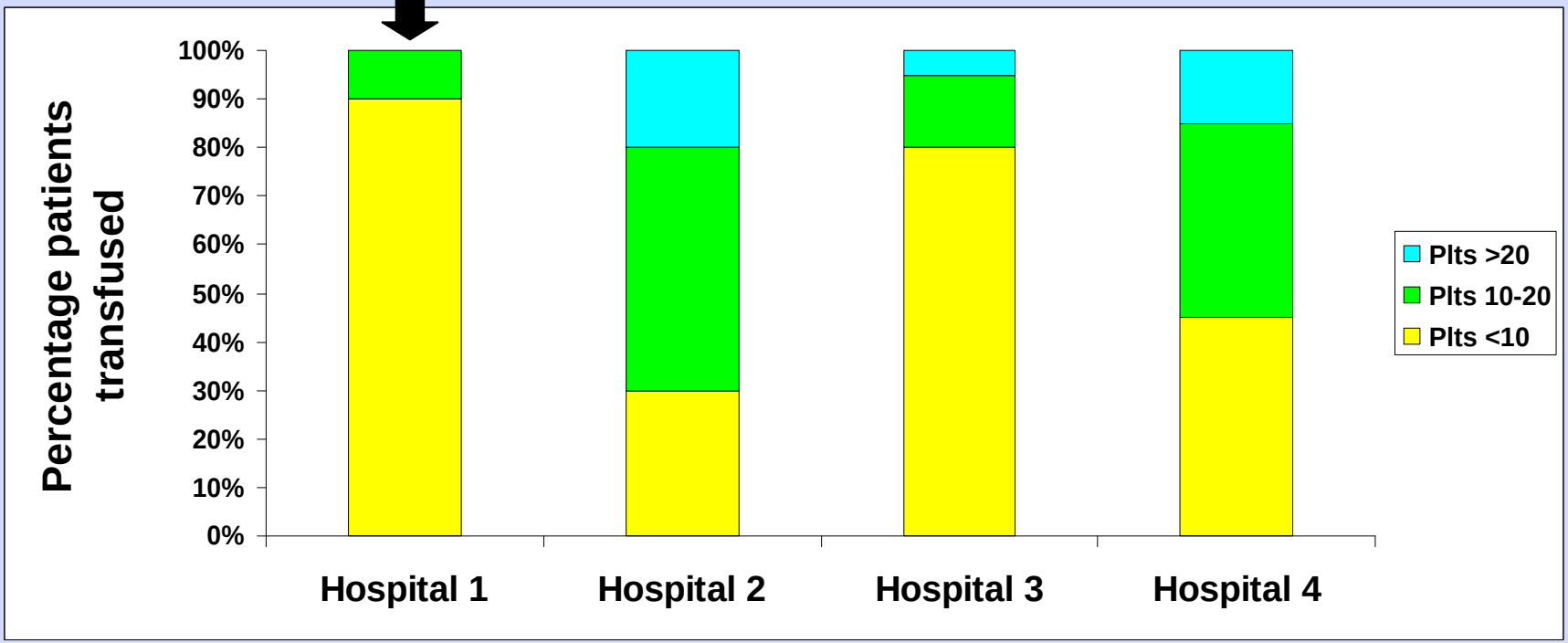


Which patients are receiving platelets in my hospital? (By HRG chapter)



Platelet use in haematology patients: stable patients with myelodysplasia

This hospital has a strict transfusion trigger of < 10 x 10^9/l for platelets
It is possible to drill down to identify the cases where transfusion occurred with a platelet count above this



Examples of Future analysis

- Percentage of transfusion of non-apheresis platelets to children under 16 years
- Percentage of children born after 1996 given standard FFP
- Post cardiac surgery outcome related to age of blood
- Use of FFP to reverse warfarin
- Total number of units (and donor exposures) transfused to individual patients
- Comparison of use for the same procedure by consultant

Future developments:
Recording the clinical reason for blood use

- The tool would become much more powerful if there could be a field in LIMS with a coded reason for clinical use
- The code would come from a standardised menu and would be selected by the person requesting the transfusion (ideally by electronic order comms)
- Currently there is an assumption that the HRG is the reason for transfusion – this is less accurate for medical reasons for transfusion

Potential Benefits of AIM II

- Better understanding of where and why blood and blood components are being used.

- Hospitals and physicians will have benchmarking data to support appropriate use initiatives.

  – Hospitals wanting to utilise benchmarking have been hindered by limited data or lack of comparative data.
  – At individual hospital level will be able to establish baseline performance and how it compares to regional / national / international peers
  – Starting point for interhospital collaborations to identify best practice that could be implemented in other hospitals.

Potential Benefits of AIM II

- NHSBT will benefit as knowledge of clinical use will inform strategic planning
  - Ensure sufficiency of supply
  - Maintain appropriate inventory levels to ensure supply meets demand
  - Information to evaluate safety decisions
  - Support emergency planning

Summary

- AIM II has the potential to assist hospitals and physicians together with NHSBT to better manage and use the available blood supply.
- Potential for local, regional, national and international benchmarking
- Further development will depend on the outcome of the current trial

Acknowledgements

- Trial hospitals
- AIM II Project Team
- Americas Blood Centers

Thank you for listening