

Surveillance of blood utilisation

Usefulness for hemovigilance

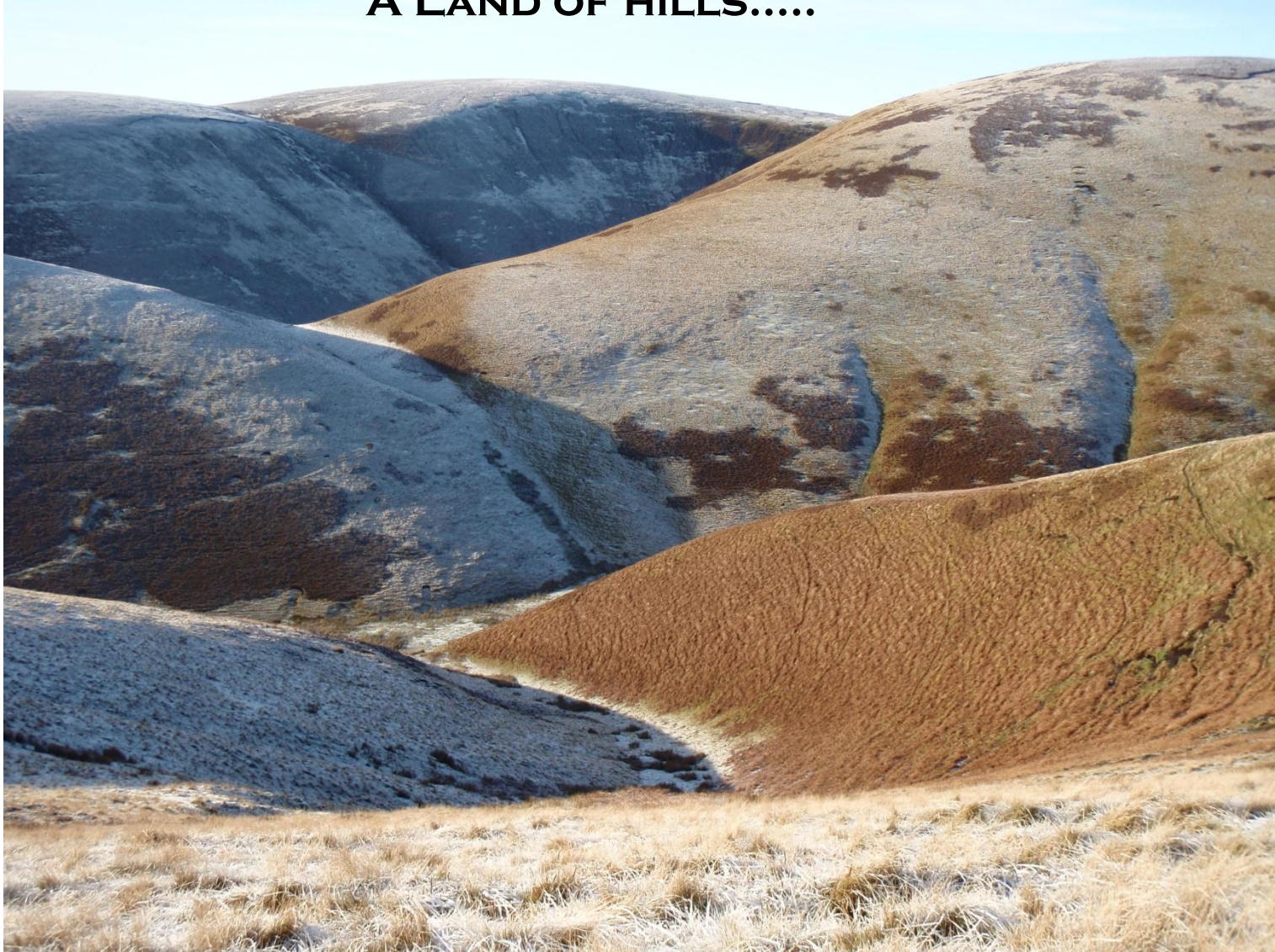
Jonathan Wallis

Freeman Hospital

Newcastle upon Tyne UK

NORTHUMBRIA

A LAND OF HILLS.....



..... AND CASTLES



Chillingham Castle



1995

Human case of
Mad cow disease or vCJD



We could not calculate the risks of transmitting vCJD
if we did not know who was receiving blood transfusion
and, what happened to them

Haemovigilance

Recording and collating
adverse effects of transfusion

Haemovigilance

Recording and collating adverse effects of transfusion with the aim of improving the benefit to risk ratio

Would you transfuse a unit of possibly
vCJD infected blood to this patient?

21 year old mother ex-sanguinating from PPH

77 year old THR with CVD, post op Hb 5.6g/dL

21 year old mother

- Likely to prevent death
- 60 yrs life saved
- Significant societal gain

But..

- Infection devastating

77 year old THR

- Death less likely
- 7 yrs life saved
- Better rehabilitation

But..

- Infection may not to be clinically manifest

Haemovigilance

Does not operate in a moral or economic vacuum

The risk benefit equation depends on many factors

The 'New Castle on Tyne' built by Robert Curthose , 1080



Son of William the Conqueror

William commissioned the Domesday book
This detailed every farmstead, every peasant,
every house in England.



*'there was no single hide nor a yard of land,
nor indeed one ox nor one cow nor one pig
which was left out.'*

Recipient factors

Who is transfused

Age

Sex

Why are they transfused

Underlying disease

Immediate indication

How long will they
survive

Procedural factors

Where are they transfused

Theatres

Day units

Home

When are they transfused

Day

Night

How old is the blood

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How old is the blood

Where does Blood Go?

Wells, A.W *et al.* 2002. BMJ, 325, 803-7

Simple paper based survey

Done in real time

Filled in by hospital blood bank

Data collected for 2 weeks x 2

All hospitals in the Northern region

Population 2.9 million

All supplied by Newcastle BTS

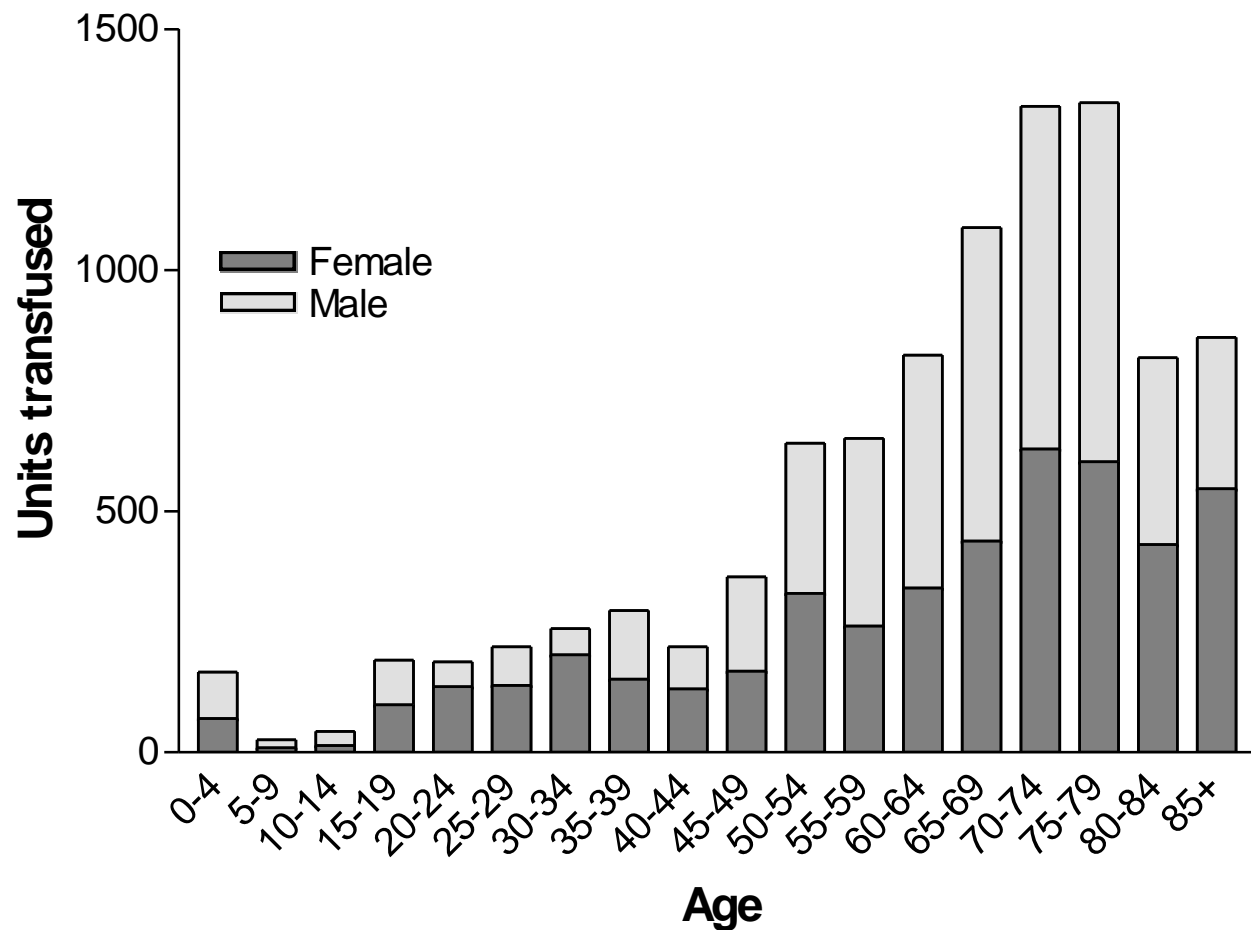
99% complete returns

Findings reported to each blood bank

Costs = £0.00

Hospital:		Form Number:	
No of Units:	Male		
Age:	Female		
Cardiothoracic Surgery		Orthopaedics	
CABG (first)	1	THR (first)	18
CABG (redo)	2	THR (redo)	19
Valve replacement (+/- CABG)	3	TKR (first)	20
Other	4	TKR (redo)	21
Specify		Other	22
		Specify	
ENT	5		
		Vascular Surgery	
		Emergency Aneurysm Repair	23
Gastrointestinal Surgery		Elective Aneurysm Repair	24
Oesophagael	6	Other	25
Gastric	7		
Pancreatic	8		
		Plastic Surgery	26
Colorectal	9		
		Including Burns	
Liver	10		
Other	11		
Specify		Other Surgery	27
		Specify	
Neurosurgery	12		
		Obs & Gyn	
		Gynae (non malignant)	28
Trauma		Gynae oncology	29
RTA	13	Obstetrics	30
Fractured NOF	14	Intra-uterine transfusion	31
Other	15		
Specify			
		Paediatrics	
		Neonatal	32
Urology	16	Other	33
		Specify	
Solid Organ Transplant	17		
Specify			
		GI Bleed	34
		Acute Chronic N/K	
		Anaemia due to:	
		Renal Failure	35
		Cancer (non-haematologica	36
		Iron deficiency	37
		B12/folate def	38
		Chronic disorders	39
		(e.g. Rheumatoid Arthritis)	
		ITU/HDU admission	40
		Unknown cause	41
		Other	42
		Haematology	
		MSD	43
		AML/ALL	44
		Myeloma	45
		Hodgkins/NHL/CLL	46
		Acquired Haemolytic anaemia	47
		Inherited anaemia	48
		(e.g. Thalassaemia)	
		Myelofibrosis	49
		Other	50
		Specify	

Transfusion by age



Use by speciality

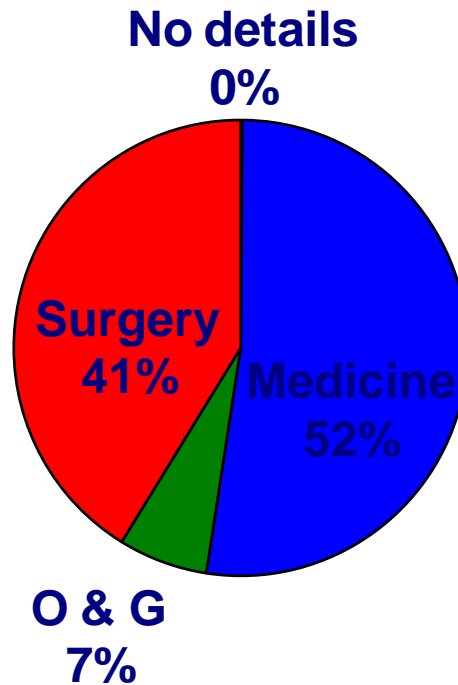


Table 2: Surgical indications for red cell use 2009.

Surgical category	Total	Percentage of surgical use	Percentage of total use
Cardiac (Excluding heart/lung transplant)	336	14.2	4.1
ENT	37	1.6	0.5
Abdominal surgery (excluding solid organ transplant)	398	16.9	4.9
Neurosurgery	31	1.3	0.3
Trauma (including fractured femur)	280	11.8	3.4
Urology	112	4.7	1.4
Solid organ transplant	67	2.8	0.84
Orthopaedic	608	25.8	7.5
Vascular	202	8.6	2.5
Plastic surgery	56	2.4	0.8
Other surgery	233	9.9	2.9
Total	2360	100	29

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Procedural factors

Where are they transfused

Theatres

Day units

Home

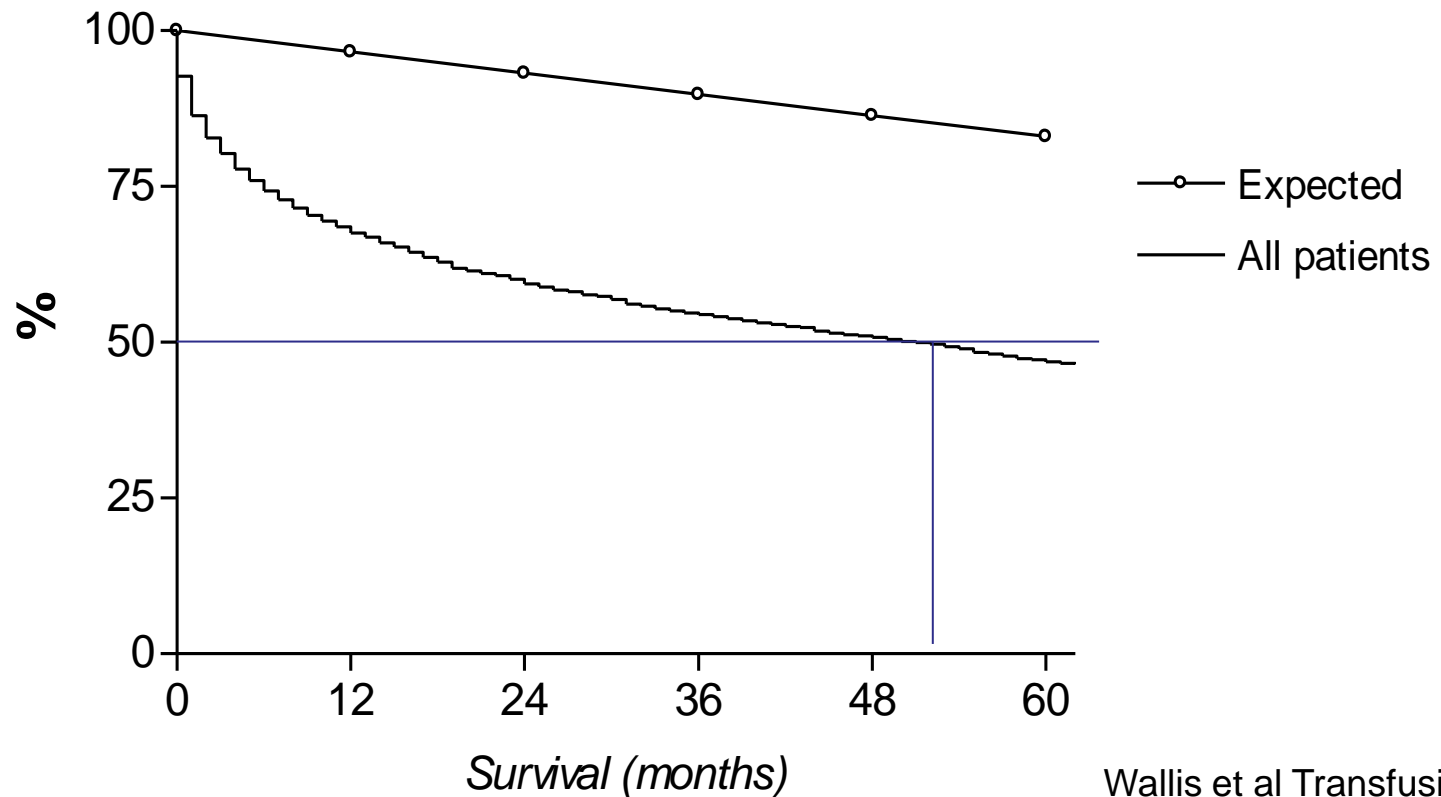
When are they transfused

Day

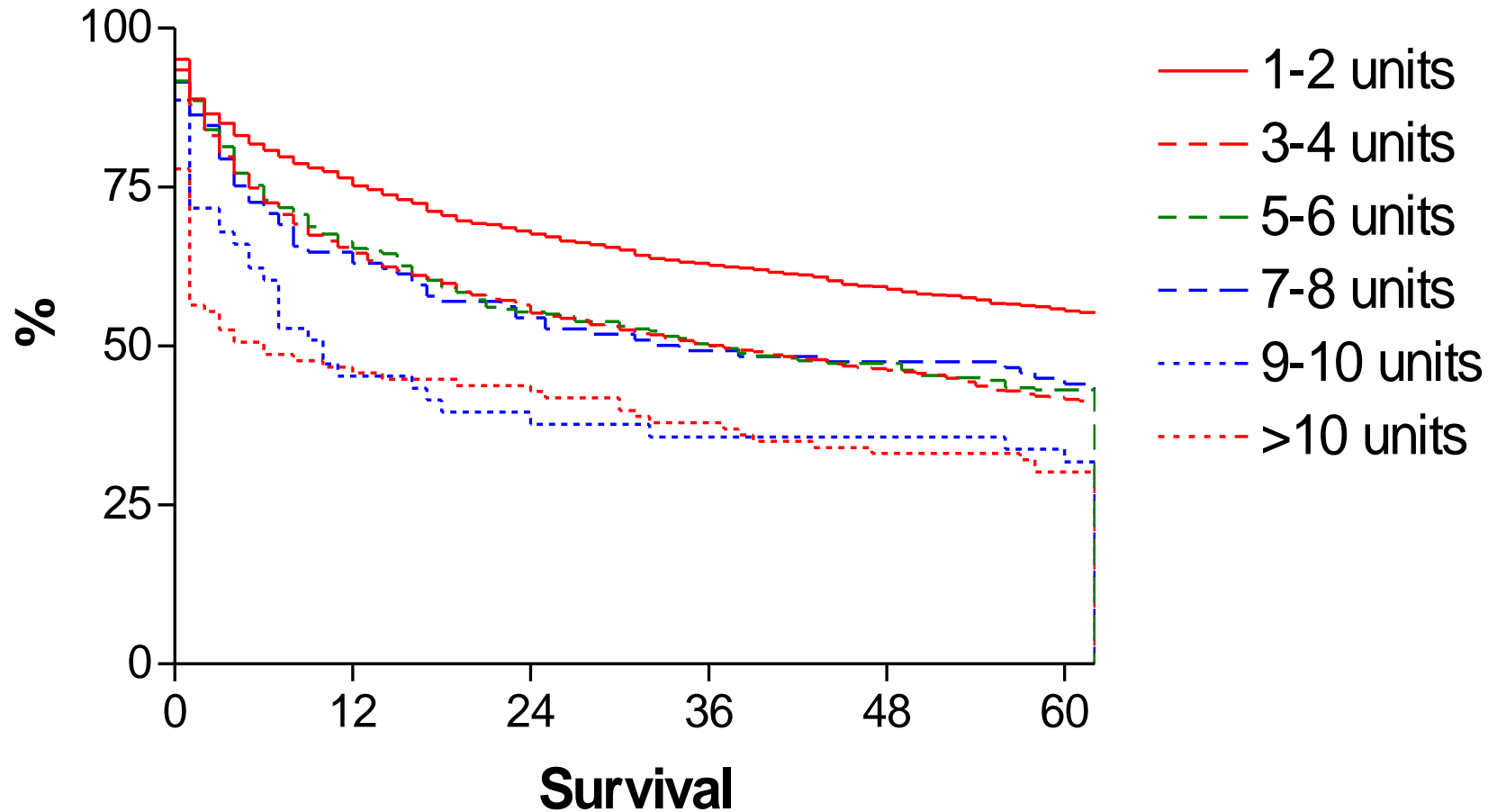
Night

How old is the blood

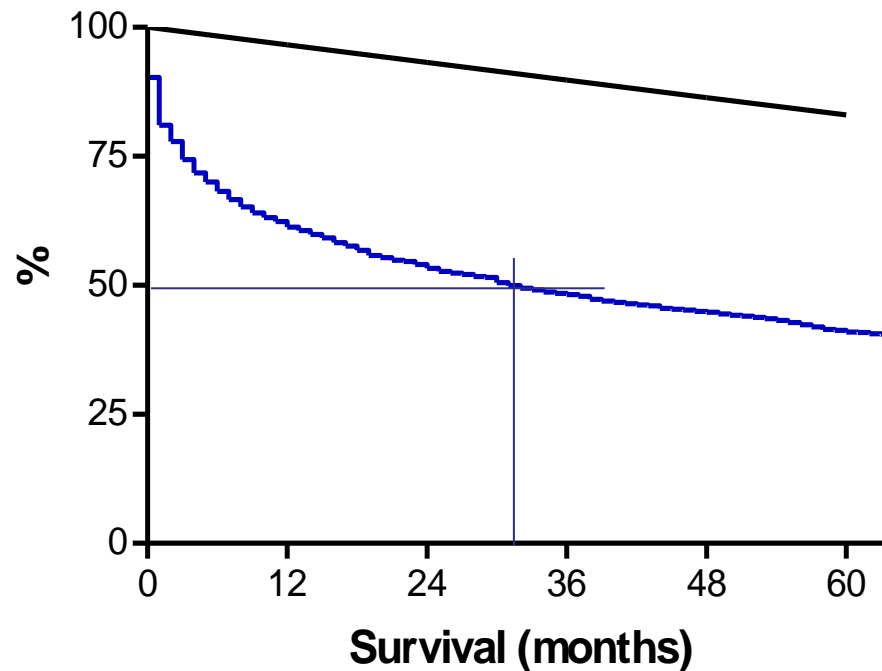
How long do red cell recipients survive?



Patient survival by number of red cells received



Survival by red cell units



— *Expected*
(5 yr survival 83.0%)

— *Survival by red cell units*
(Median survival 30 months, 5 yr survival 40.9%)

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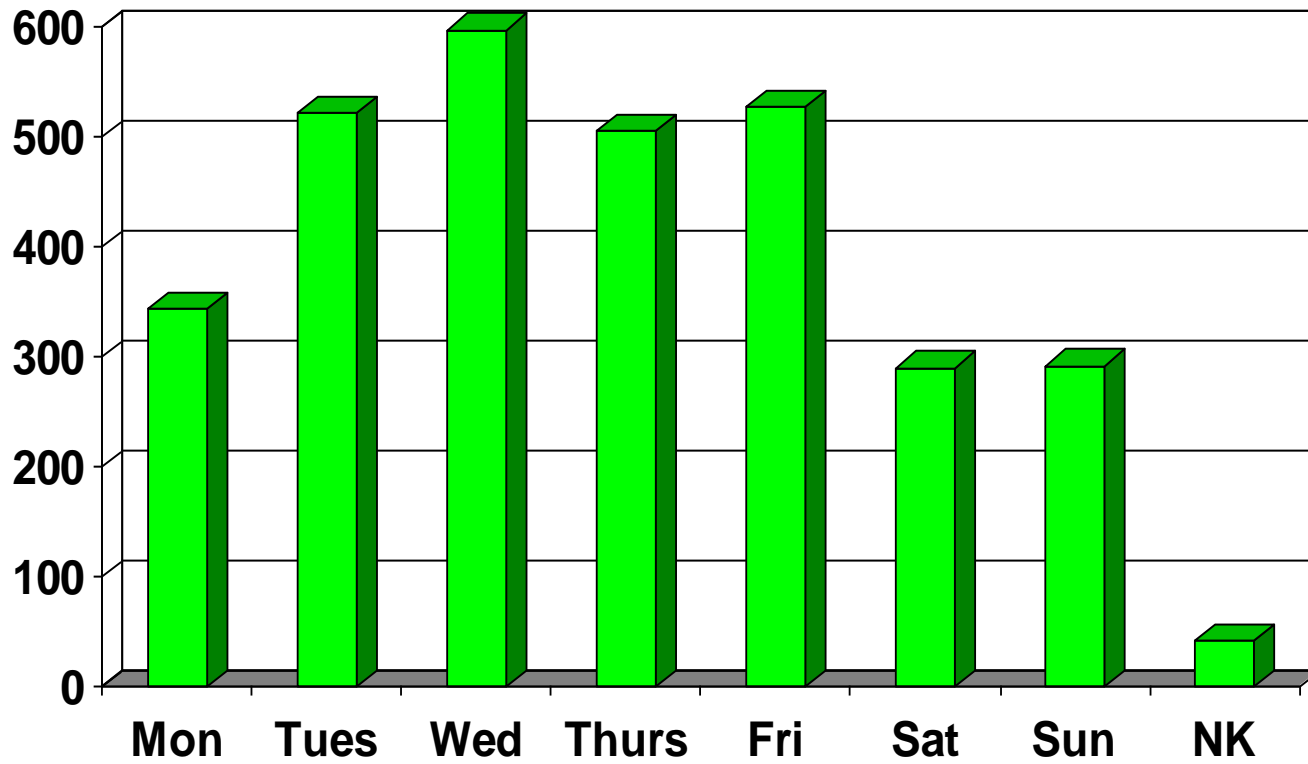
When are they transfused

Day

Night

How old is the blood

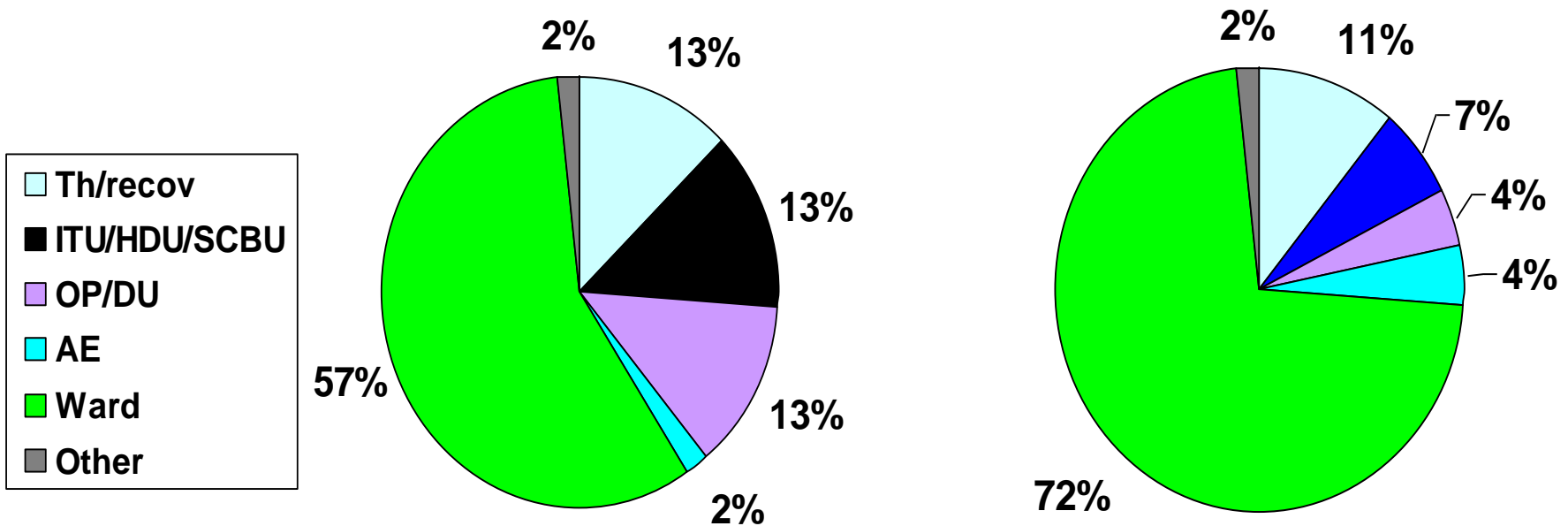
More transfusions happen on a Wednesday!



Courtesy of Dr Hazel Tinegate

Transfusion Location

Hazel Tinegate et al NHSBT & SHOT



Northern and Yorkshire data

SHOT data 2005

Adverse events are more likely to be reported for

- 1.transfusions given on A/E, and general wards
- 2.Transfusions given out of normal working hours
3. Transfusions cross matched out of hours

Utilisation surveys help inform Haemovigilance

Provide denominator data

Predicting future risks

Identifying high risk areas

Cost benefit calculations for interventions

March 2012

Blood service:

‘A donor has converted to HIV positive, the last unit pre-conversion came to your hospital’

Me:

‘ Whoops, OK I’ll find out who received the blood’

Questions

Is the recipient still alive?

Has the recipient developed HIV?

Was the transfusion justified?

Exposing a patient to a measured risk....

OK

Exposing a patient to an unnecessary risk...

Not OK

Haemovigilance

Recording and collating adverse effects of transfusion with the aim of improving the benefit to risk ratio

Knowing all transfusion carries some risk , ensuring that transfusion is always justified on clinical grounds

There are things we know

There are known unknowns

And there are unknown unknowns

Report on the collection, testing and use of blood and blood components in Europe in 2004
CL Van der Poel et al. Council of Europe

Country	Red cell use per 1000 population	Ratio FFP:RC
France	32.8	1:7.7
Netherlands	36.6	1:6.7
UK	41.4	1:7.1
Sweden	50.5	1:4
Germany	54.4	1:3.3
Greece	59.3	1:2.6
Denmark	72.9	1:6

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UK	41.4	1:7.1
Sweden	50.5	1:4
Germany	54.4	1:3.3
Greece	59.3	1:2.6
Denmark	72.9	1:6
Canada 2008*	35.2	???
USA 2008**	48.8	1:3.6 (2001)
UK 2009	36	1:7

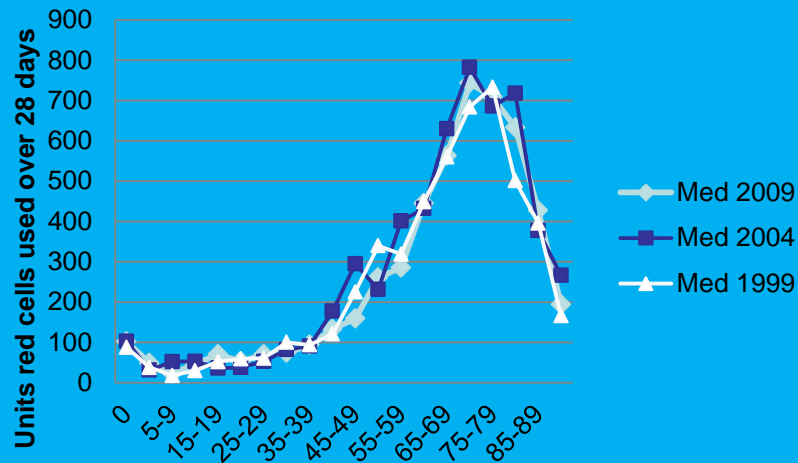
Drackley et al Transfusion 2012; 52:366-74

**www.census.gov/ipc/www/idb/country.php

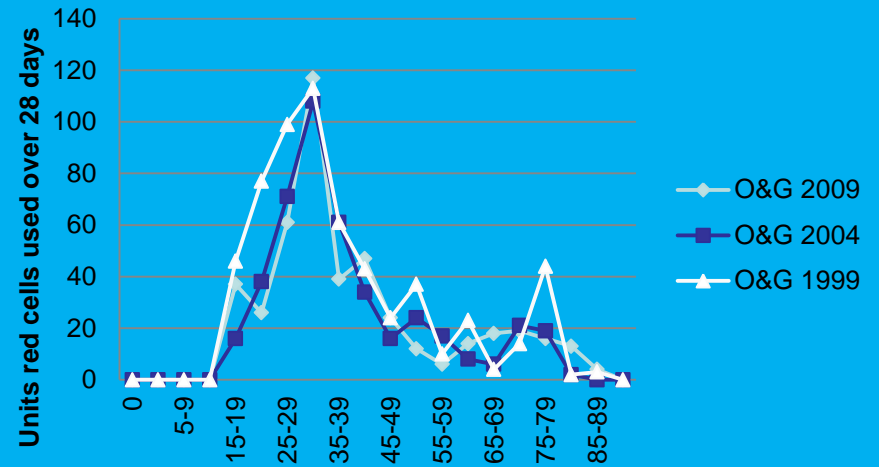
Changes in blood use in North of England 1999-2009

	1999/2000		2004		2009	
	Units transfused	Percentage of all blood transfused	Units transfused	Percentage of all blood transfused	Units transfused	Percentage of all blood transfused
Medical	5047	52	5558	62	5156	64.2
Surgical	3982	41	3001	33	2360	29.4
Obs/Gyn	612	6	444	5	509	6.4
Total units transfused	9774		9003		8025	

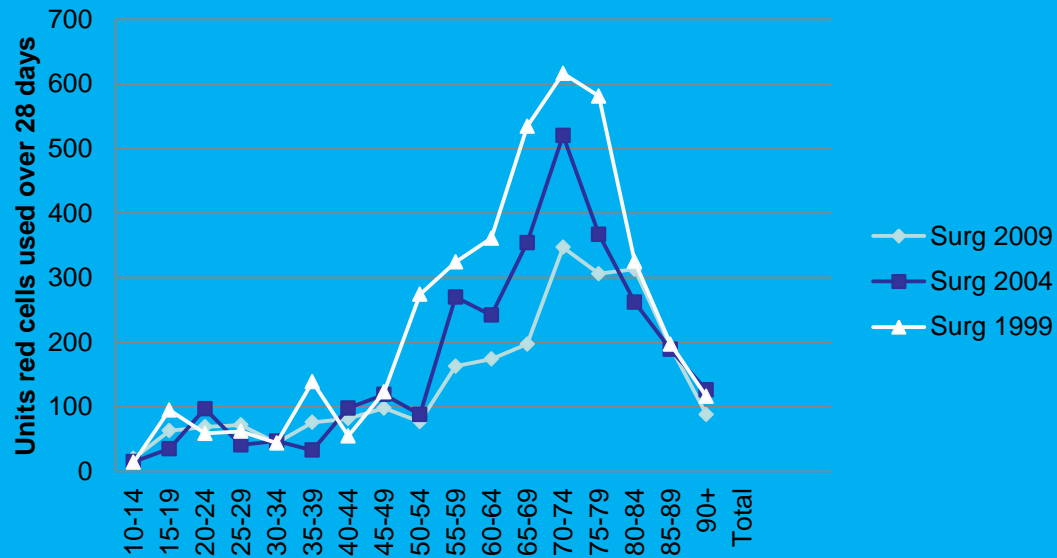
Medical use of red cells over 10 years



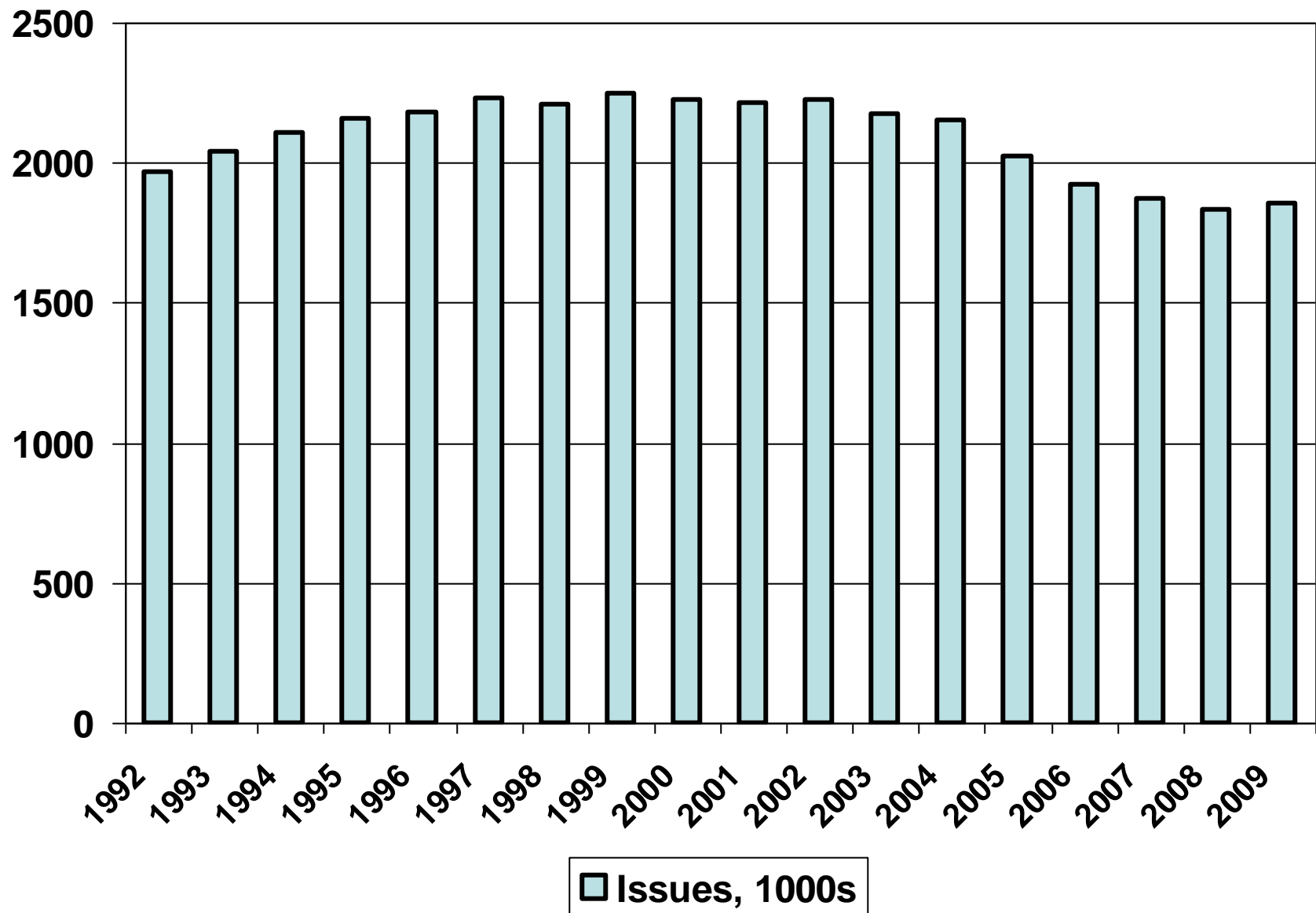
Obstetric and Gynaecology use of red cells over 10 years



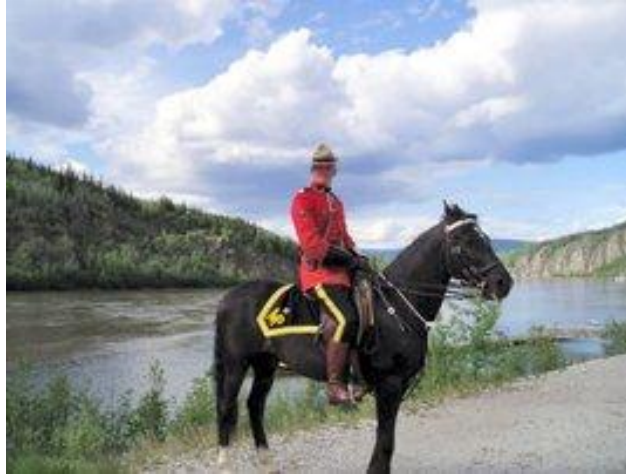
Surgical use of red cells over 10 years



Red cell issues in England and N Wales 1992-2009



What led to the change?



Transfusion in Critical Care Trial
Hebert et al NEJM 1999

Causes of change in red cell use

- TRICC trial: Changes in transfusion triggers
- Introduction of transfusion practitioners
- 'Better Blood Transfusion' initiative
- Increasing cost of blood
- (Reduction in cardiac surgery)
- (Improvement in surgical techniques)
- (Cell salvage)



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Red cell use in cardiac surgery

US: 7.1% of $48.8 = 3.5$ units per 1000 pop

UK: 4.1% of $35 = 1.5$ units per 1000 pop

United States Census Bureau. International Database.

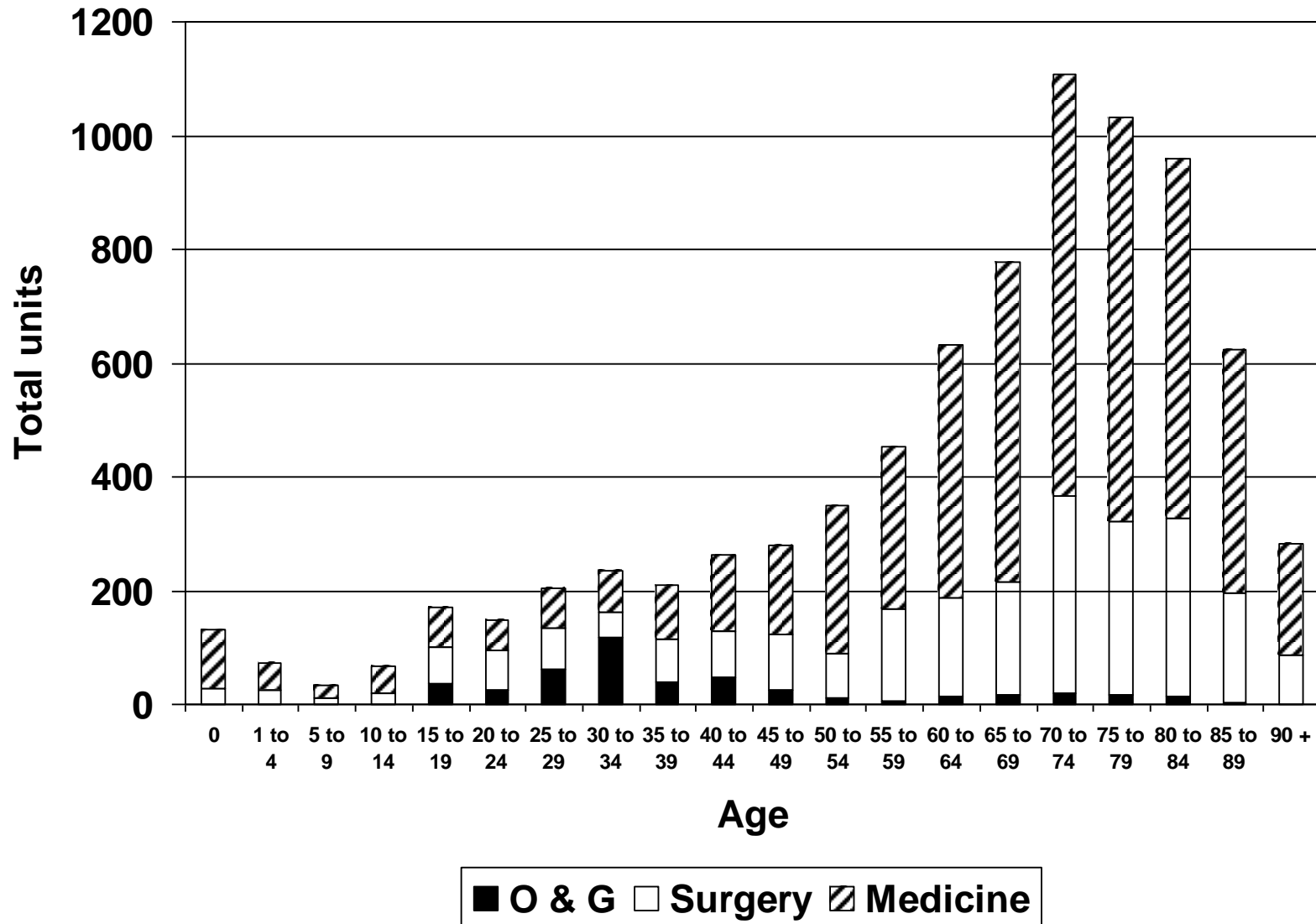
[cited 2010 Dec 30]. Available from: URL: [http://](http://www.census.gov/ipc/www/idb/country.php)

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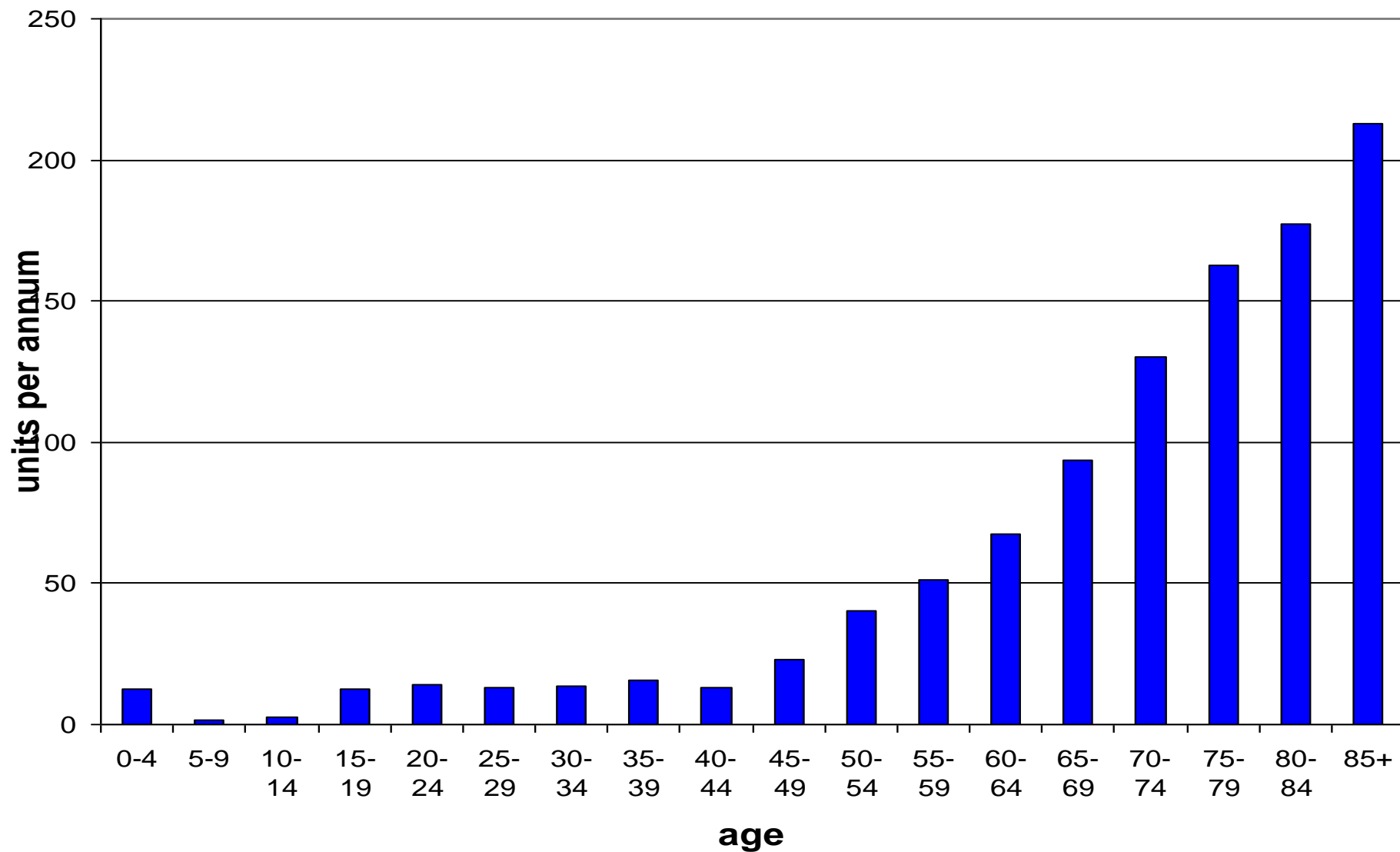
Tinegate et al. Submitted for publication 2012.

Red cell use by age

North of England 2009



Units red cells per annum per thousand population



One year period prevalence of blood transfusion

Madsen, Titlestad et al, Transfusion medicine 2010; 20: 191-5

- Standardised transfusion rates based on WHO standard population structure
- Allows comparison between populations without population demographics affecting results.

If one country is using $> 2x$ as much blood for cardiac surgery than another..

If transfusion of stored blood has deleterious effects..... (See Koch et al NEJM 2009, Murphy et al)

Then these differences should be far more important to haemovigilance officers than rates of minor allergic reactions

Utilisation studies

Recipient factors

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How old is the blood

Proposed ISBT Indication codes for erythrocyte transfusion

- **E1 Acute blood loss ie active bleeding**
 - To maintain Hb >70g/L in an otherwise fit patient
 - To maintain Hb >80g/L in an elderly but otherwise fit patient
 - To maintain Hb >90g/L in a patient with known cardiovascular disease
- **E2 Acute anaemia eg post operative but haemodynamically stable**
 - To maintain Hb >70g/L in an otherwise fit patient
 - To maintain Hb >80g/L in an elderly but otherwise fit patient
 - To maintain Hb >90g/L in a patient with known cardiovascular disease
- **E3 Chronic correctable anaemia**
 - Planned surgical procedure and Hb 70-100g/L depending on procedure
 - To reduce symptoms/ enable discharge from hospital????
 - Frequent Angina or heart failure
- **E4 Chronic anaemia that is not correctable**
 - Bone marrow failure inherited. To maintain Hb > xx
 - Bone marrow failure acquired. To alleviate symptoms, typically to maintain Hb> 80g/L
 - Continuous bleeding or haemolysis
- **E5 To alleviate damage due to patient's own red cells**
 - Acute top up or exchange transfusion for sickle cell crisis
 - Chronic exchange transfusion for sickle cell disease
 - Exchange transfusion to prevent kernicterus
 - Exchange transfusion for malaria
 - Other
- **E6. Radiotherapy**
 - To maintain Hb >110g/L for radiotherapy where this has been shown to be associated with a better response to treatment.

Clinical code

- Surgical
 - Orthopaedic
 - TRH 18
 - TKR 19
 - Spinal 20
 - Other 21
 - Cardiac
 - CABG 1st 22
 - CABG redo 23
 - Valve 24
 - Other 25
- Medical
 - GI bleeding 41
 - Haematology 42
 -
 -
 -

Indication code

- E1 active bleeding
 - Trigger <7g/dl young
 - Trigger <8g/dl elderly
 - Trigger <9g/dl Acute coronary
- E2 Acute anaemia but haemodynamically stable
 - <7g/dl
 - <8g/dl
 - <9g/dl
- E3 Chronic correctable anaemia
- E4 Anaemia not correctable
 -
 -
 -

CODE = 20 E2

How?

- Paper or electronic
- Intermittent or continuous
- Prospective or Retrospective
- Simple codes or CD codes (eg AIM2)

Surveillance of blood utilisation

Usefulness for hemovigilance?

Utilisation surveillance should be
an integral part of haemovigilance

and another thing.....

ABO errors SHOT 2010

There was 1 case of major morbidity reported as a result of an ABO incompatible transfusion

▪

A patient with a haematemesis was in need of an urgent blood transfusion.

The patient's wristband was contaminated with blood and could not be read

As a consequence the electronic bedside checking system was not used.

ABO errors SHOT 2009

- *An elderly patient with an underlying heart condition was transfused, **during** hip arthroplasty....*
- *An elderly patient was admitted as **an emergency** during the night with chest pain, ECG changes, chest infection and iron deficiency anaemia, and was deteriorating....*
- *ITU patient receives ABO-incompatible transfusion **despite** electronic bedside device...*
- *Cancer day unit: Incorrect unit collected and transfused **despite** training, competency-assessment and fridge locking system...*
- *Man receives **emergency** transfusion which is both ABO and D incompatible with no ill effects...*

Group O blood only for non-elective transfusion

- Sampling errors..mainly out of hours
- Administration errors..mainly out of hours
- Collect more group o red cells with apheresis
- Use fresh gp O blood for all non elective transfusions

Alnwick Castle, Northumbria



Getting blood transfusion right is not always a picnic