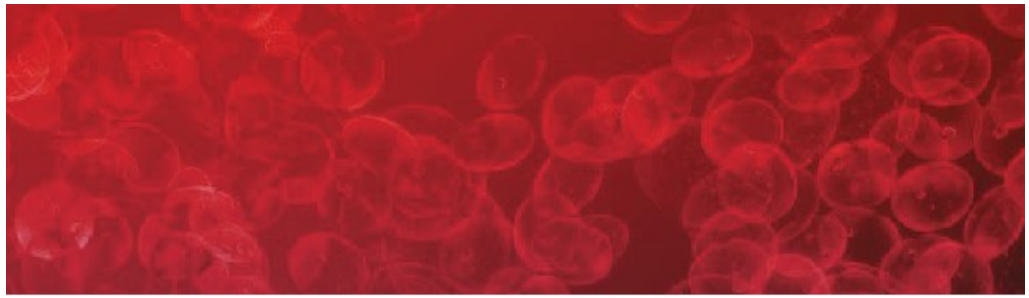
Transfusion-related adverse reactions and events in neonates

What this talk will cover

- Introduction to SHOT, the Serious Hazards of Transfusion scheme
- SHOT data on events (errors) and reactions in neonates
- Specific types of problems
- Discussion of whether reactions/events are commoner in neonates



ANNUAL SHOT REPORT 2012

Affiliated to the Royal College of Pathologists

The Steering Group includes members representing the following professional bodies:

British Blood Transfusion Society
British Society for Haematology
British Society of Gastroenterology
British Committee for Standards in Haematology
Faculty of Public Health
Institute of Biomedical Science
Public Health England
(formerly the Health Protection Agency)
NHS Confederation
Royal College of Anaesthetists
Royal College of Nursing
Royal College of Midwives
Royal College of Obstetricians and Gynaecologists
Royal College of Physicians
Royal College of Surgeons
Royal College of Paediatrics and Child Health
Intensive Care Society
Faculty of Intensive Care Medicine
The College of Emergency Medicine
Defence Medical Services
UK Forum

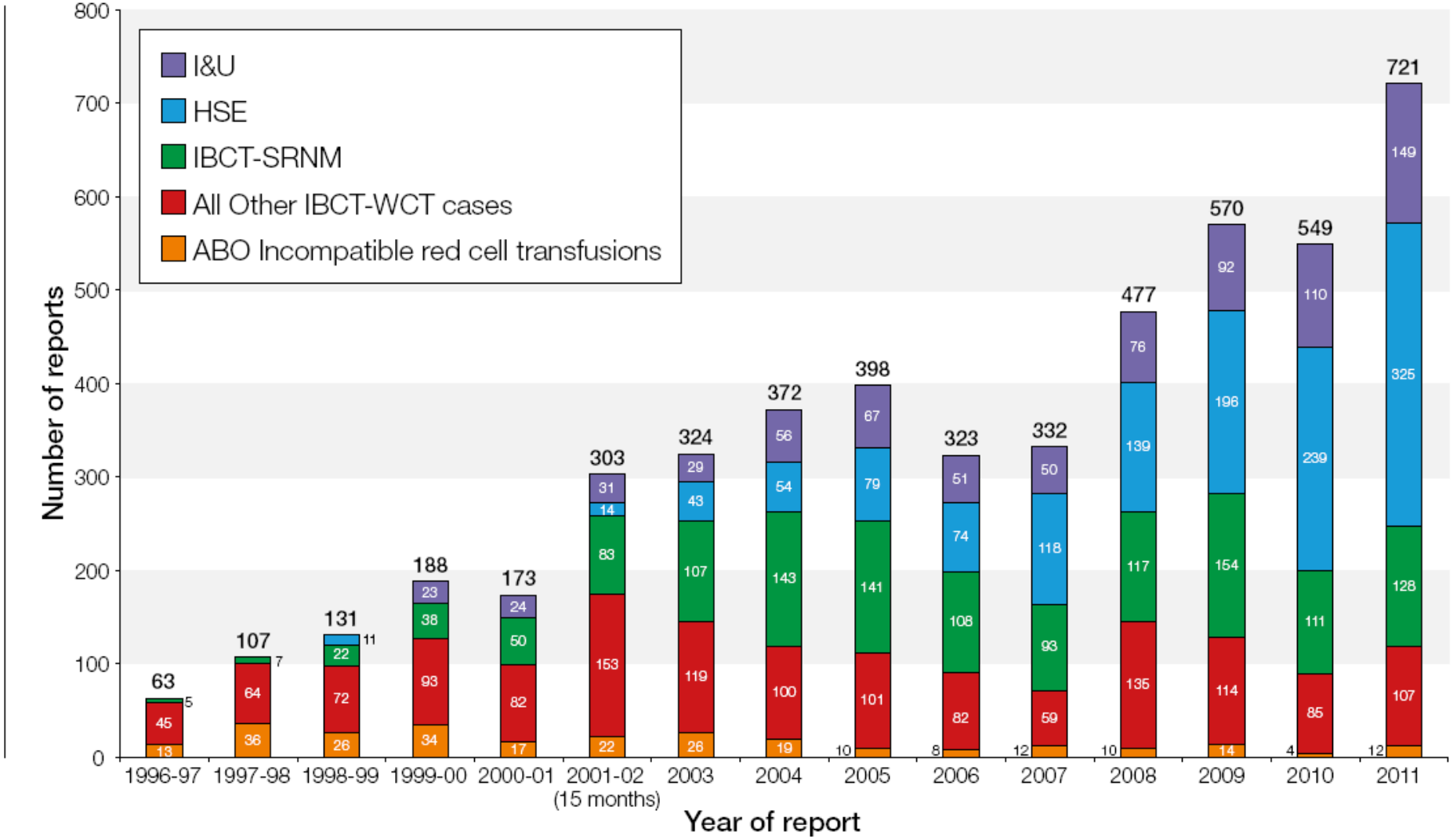
Serious Hazards of Transfusion (SHOT) scheme

- Haemovigilance reporting scheme
  - Systemic reporting of morbidity and mortality arising from transfusion of blood and components
- Professionally mandatory
  - GMC: (Doctors must) contribute to confidential enquiries and to adverse event recognition
  - Francis report: (Need for) relentless focus on patient safetly
- Works towards closer collaboration with the MHRA SABRE reporting scheme
  - SHOT analyses reports in depth
  - Classifies appropriately
  - Produces eduactional vignettes

History of Neonatal reporting in SHOT

- First report 1996-7
  - Ages of patients not specified
- Paediatric chapter first introduced in 2007

Reports caused by human error-all ages



Cumulative SHOT reports all ages

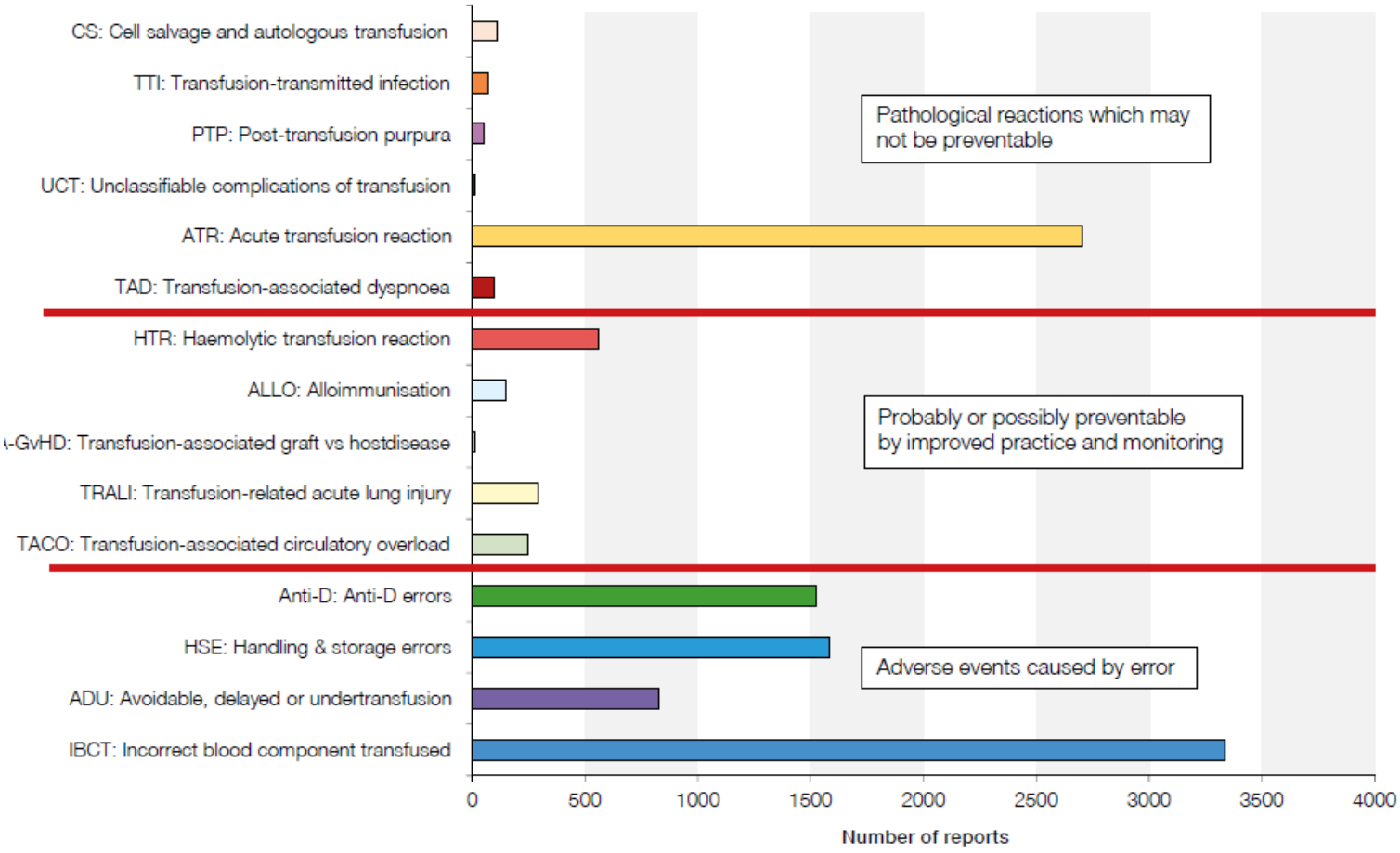


Figure 4.2: Cumulative data for SHOT categories 1996/7-2012 n=11,570

First 10 years' haemovigilance in children and neonates: Stainsby et al, 2008

- Neonates particularly at risk of ID errors
  - Often called "baby"
  - Share same DOB
  - Not very good at confirming their ID
  - May not have identity band
- Acute transfusion reactions may not be easily identified
- Small circulatory volume may increase risk of transfusion-associated circulatory overload (TACO)
- Long survival post-transfusion increases concerns about long-term risks
  - Viral inactivation of plasma

SHOT reports for neonates from 2008-2012

	Incorrect blood component	Special requirements not met	Acute transfusion reactions	Transfusion-associated circulatory overload	Avoidable, delayed or under-transfusion
2007	6	6			
2008	10	5	1		
2009	5	2	2		4
2010	6	2	3		1
2011	6	1	3	1	1
2012	6	2	2		5

SHOT reports for neonates from 2008-2012

	Incorrect blood component	Special requirements not met	Acute transfusion reactions	Transfusion-associated circulatory overload	Avoidable, delayed or under-transfusion
2007	6	6			
2008	10	5	1		
2009	5	2	2		4
2010	6	2	3		1
2011	6	1	3	1	1
2012	6	2	2		5

And one case of transfusion-associated graft versus host disease

Incorrect blood components transfused: 39 in neonates since 2007

- A patient was transfused with a blood component that was intended for another patient, was a component of a different type than that requested or did not meet the specific transfusion requirements of the patient

IBCT due to blood intended for another, 2008

- Neonate transfused with blood intended for the twin sister

IBCT due to using inappropriate component, 2009

- Baby born by LSCS with Hb 62g/L due to HDN (maternal anti-c)
- Lab were trying to provide suitable blood
  - O RhD negative found to be incompatible (cde/cde)
  - Crossmatching O positive (Cde/Cde)
- In the mean time, clinicians had removed adult emergency O neg (“flying squad”) blood without informing the transfusion lab
- Baby suffered an immediate reaction and bilirubin rose further, needing exchange

Problems highlighted

- Communication

Lab inform clinical team of progress

Clinicians communicate urgency, check whether flying squad blood is suitable

- Lack of understanding of HDN

Major morbidity due to IBCT, adult

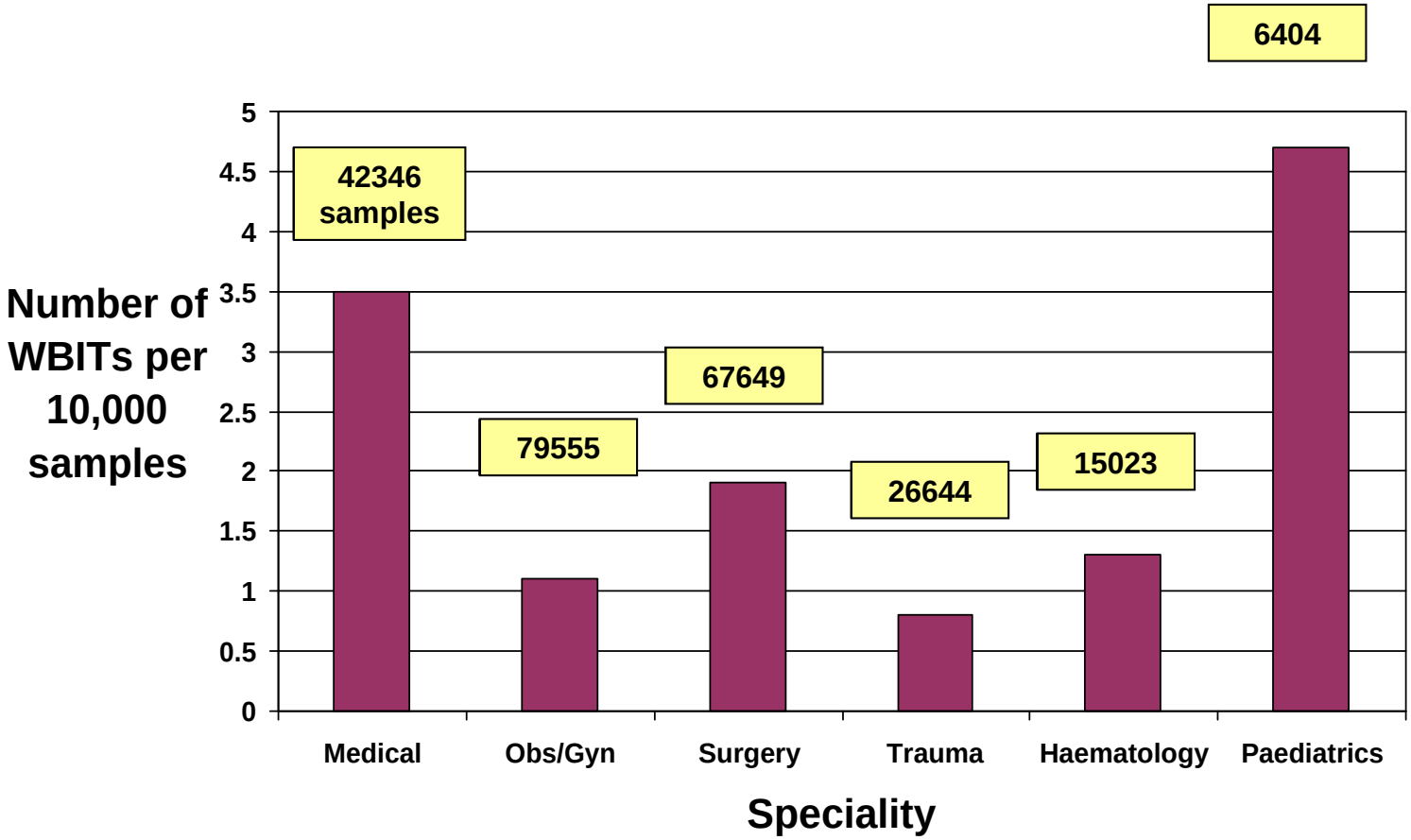
- A patient was given A Rh positive red cells due to failure of the bedside check
- He was group O Rh positive
- He developed rigors
  - Temp rise of 2.8C
  - Tachycardia, tachypnoea
  - Oxygen sats fell from 95% to 75%

ABO incompatible transfusions carry a 10% mortality

Near misses due to “Wrong Blood in Tube”

- Blood in the sample tube is labelled with details of a different patient
- Rate of WBIT probably 1 in 2-3000 samples
- 40 “near misses” in neonates in 2012-at least half likely to be WBIT

WBIT by specialty



What caused the WBIT?

- Reasons identifiable in 34 instances
- Often multiple reasons
  - Labelled away from patient 15 instances
  - Failure to use correct ID 11
  - Both the above 3
  - Distraction 3
  - Lack of training 2
  - Handed to another to label 3
  - Twin mix up
  - Mother-cord blood transposition

Neonatal special requirements for red cells

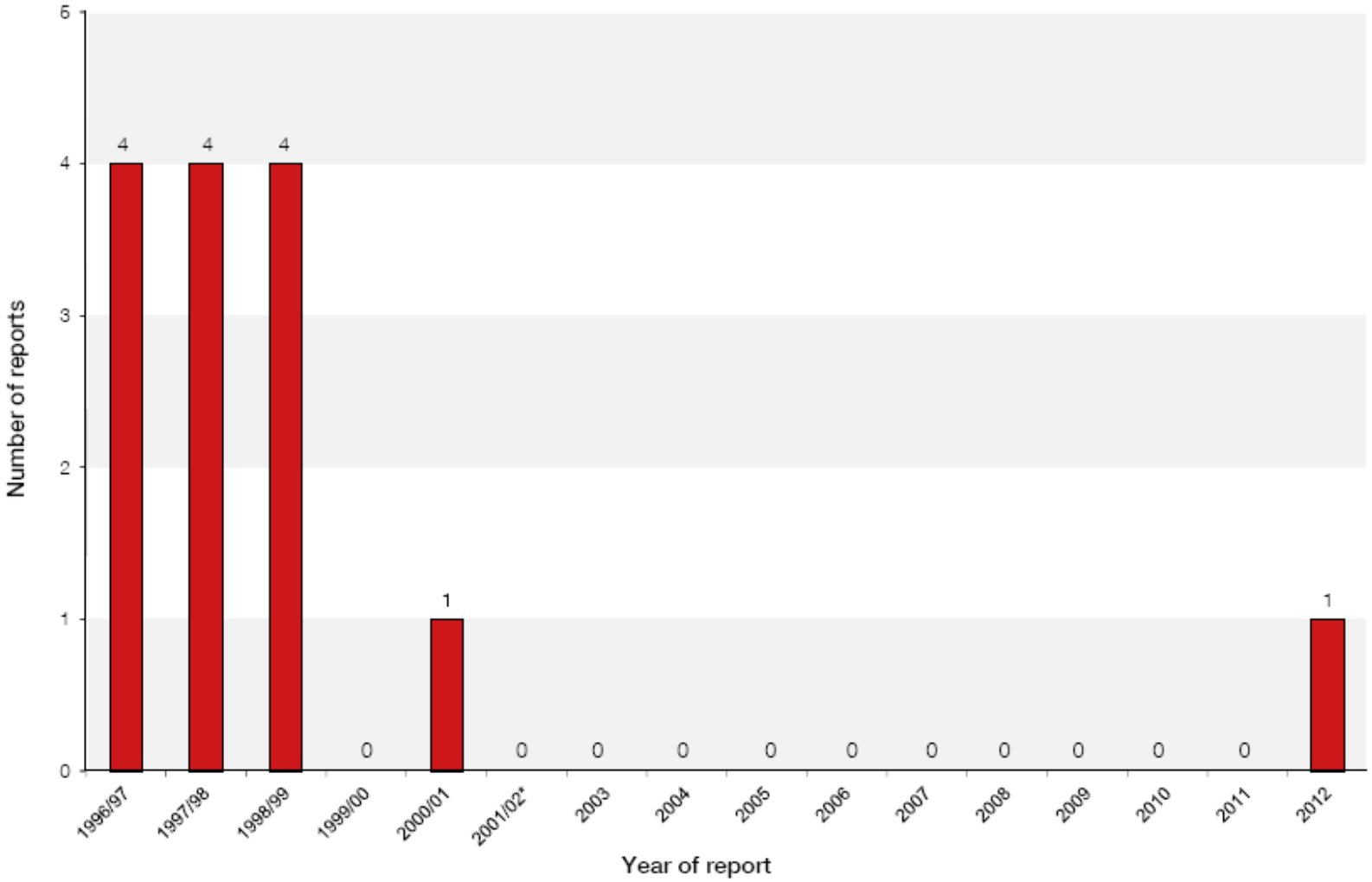
- Haematocrit 0.5-0.7
- SAG-M with approx 20 ml residual plasma
- Usually O RhD negative unless needs to be Rh compatible with neonate
- CMV negative
- Blood should be irradiated if has had intra-uterine transfusion, up to 6 months after the *expected* delivery date

Neonate: special requirements not met, 18 cases so far

- 2009 case
- Baby had undergone IUT for HDN
- Presented with Hb of 44 g/L
- Transfused with a paedipak of non-irradiated blood
- Neither the request form or the prescription indicated that irradiation was required
- The lab were not aware that it was needed in this circumstance

Transfusion-Associated Graft versus Host Disease

Cases of TA-GVHD



2012 case

- Fetus of 21 weeks gestation required an urgent IUT due to maternal parvovirus infection and signs of severe anaemia on ultrasound
- FMU understood red cells for IUT required 24 hours notice, so they transfused 15 ml maternal blood
- Procedure uneventful and fetal Hb rose from 44 to 100 g/L
- Later fetus developed bradycardia and poor cardiac output so a further 18 ml maternal blood transfused
- 32 weeks, emergency LSCS performed due to reduced fetal movements
- Neonate was hydropic and pancytopenic due to marrow aplasia
- Conjugated hyperbilirubinaemia
- Fungal chest infection
- Marrow chimerism studies showed maternal engraftment
- The mother was HLA-homozygous
- Baby underwent a stem cell transplantation from the mother but died of pneumonitis

Commentary

- TA-GVHD almost universally fatal
- Prevented (probably) by irradiation of components
- Markedly reduced by universal leucodepletion, introduced 2000
- Increased risk
  - recipients with reduced immunity
  - HLA-identical donors

Red cells for IUT

- Not a 24 hour component
- But request to door may take 2-6 hours
- If urgent, can use
  - Neonatal exchange unit
  - Irradiated paedipack
  - Non-irradiated paedipack if urgent
- NOT maternal blood

Avoidable, delayed and over-transfusion

Likely causes of avoidable transfusion, all ages, 2012

- Dilute sample 12 cases
- POCT-blood gas analyser 9 cases
- WBIT blood count sample 9 cases
- Inadequate sample-(lab should not release result) 5 cases
- Clumped platelets/clotted sample 2 cases
- Telephoned result mis-recorded

Delayed transfusion in neonates

- 5 cases in 2012
- 1 sick neonate had delayed Tx as BMS could not be contacted
- Death but probably low or zero imputability

Transfusion Associated Circulatory Overload (TACO)

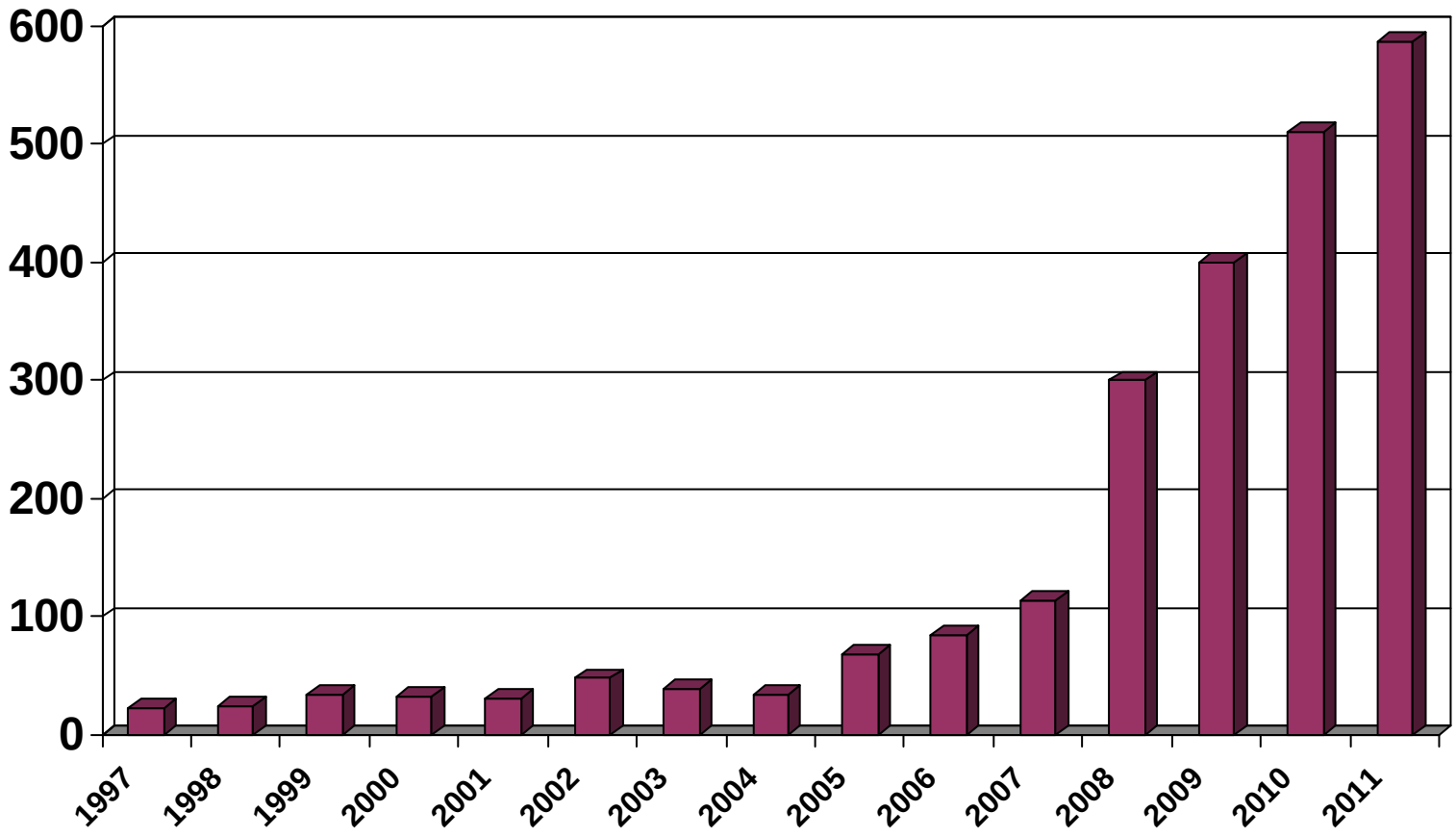
Defined as any 4 of :
Acute Respiratory Distress
Tachycardia
Increased BP
Acute or worsening pulmonary oedema
Evidence of positive fluid balance

TACO in a neonate

- A 15 day old neonate on PICU was prescribed 53 mls over 4 hours.
- The pump was set erroneously and this volume was transfused over 15 minutes
- The baby required diuretics for mild circulatory overload

“Acute transfusion reactions”

ATR numbers to 2011 all ages



Cumulative SHOT reports all ages

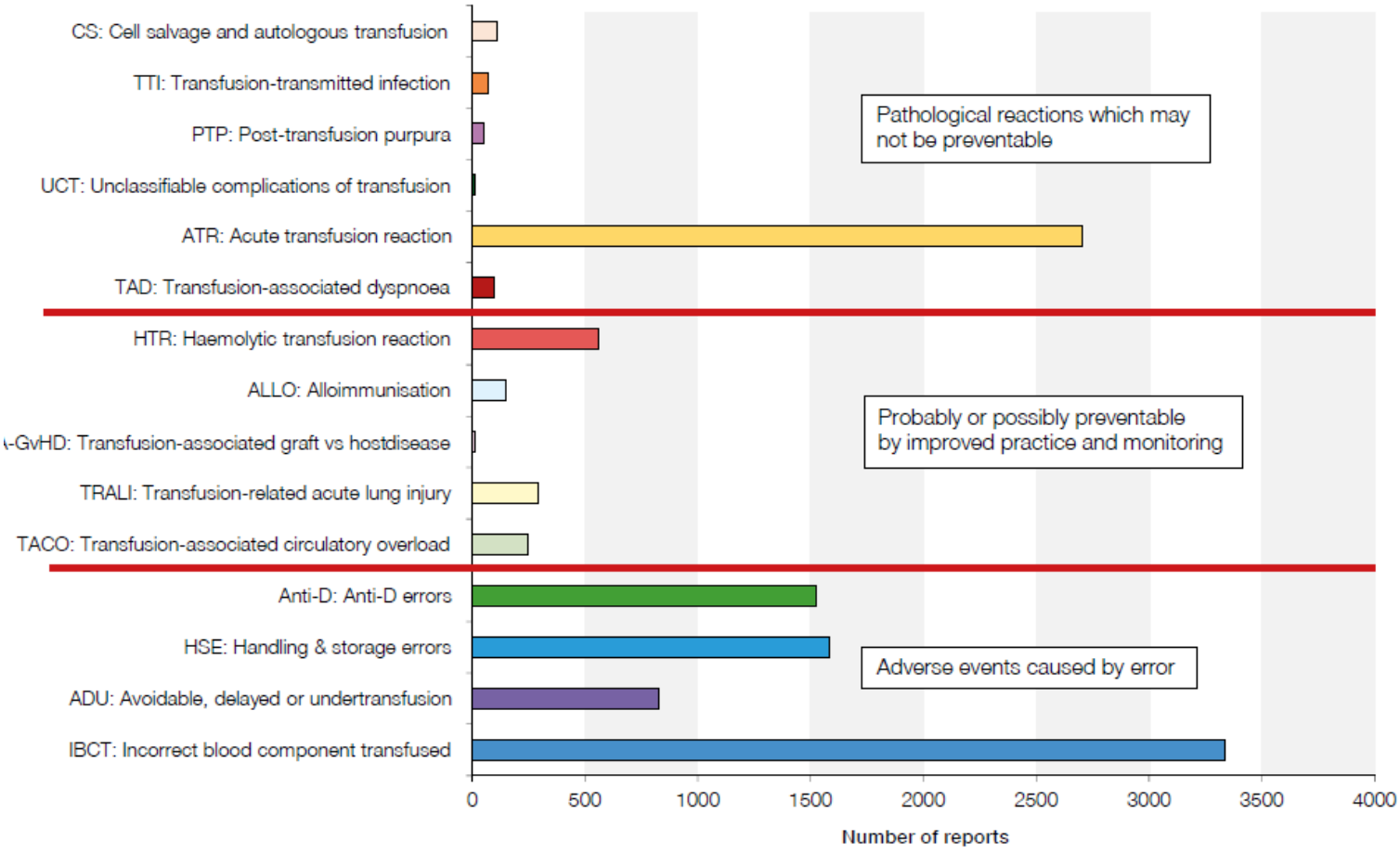


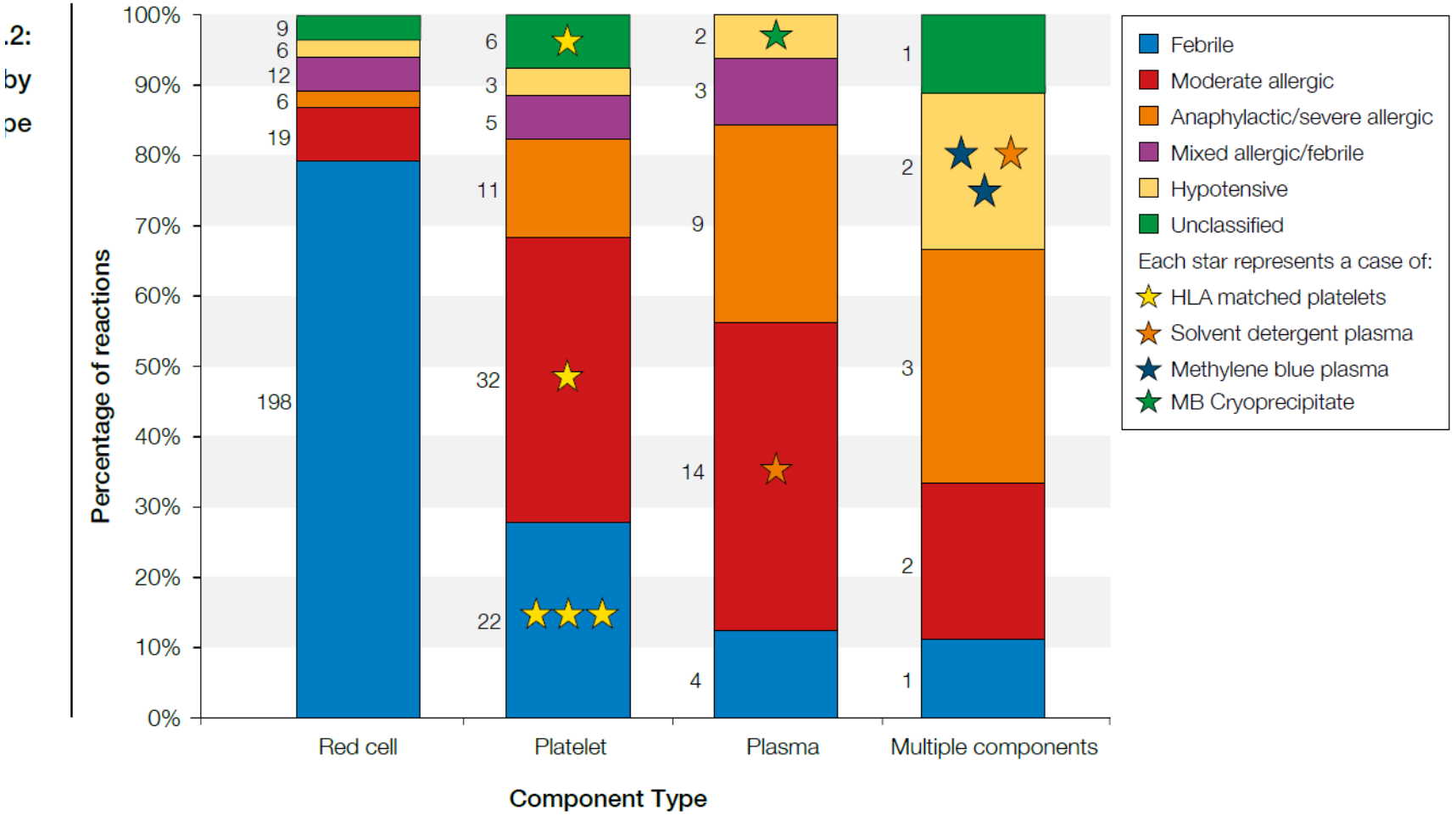
Figure 4.2: Cumulative data for SHOT categories 1996/7-2012 n=11,570

Definition

Acute transfusion reactions are defined as those occurring at any time up to 24 hours following a transfusion of blood or components excluding cases of acute reactions due to

- **Incorrect component being transfused**
- **Haemolytic reactions**
- **Transfusion related acute lung injury (TRALI)**
- **TACO**
- **(TAD)**
- **Bacterial contamination of the component**

Reactions vary according to component



Types of ATR

- Febrile
- Allergic including anaphylactic
- Mixed
- Hypotensive

Patient exhibiting possible features of an acute transfusion reaction, which may include: Fever, chills, rigors, tachycardia, hyper- or hypotension, collapse, flushing, urticaria, pain (bone, muscle, chest, abdominal), respiratory distress, nausea, general malaise

STOP THE TRANSFUSION-undertake rapid clinical assessment, check patient ID/blood compatibility label, visually assess unit
Evidence of:
Life-threatening Airway and/or Breathing and/or Circulatory problems and/or wrong blood given and/or evidence of contaminated unit

Yes

SEVERE/LIFETHREATENING
- Call for urgent medical help
- Initiate resuscitation-ABC
- Is haemorrhage likely to be causing hypotension? If not- discontinue transfusion (do not discard implicated unit/s)
- Maintain venous access
- Monitor patient: e.g. TPR, BP, urinary output, oxygen saturations.

- If likely anaphylaxis/severe allergy-follow anaphylaxis pathway
- If bacterial contamination likely start antibiotic treatment
- Use BP, pulse, urine output (catheterise if necessary) to guide intravenous physiological saline administration
- Inform hospital transfusion department
- Return unit (with administration set) to transfusion laboratory
- If bacterial contamination suspected contact blood service to discuss recall of associated components
- Perform appropriate investigations (see Table 1)

- Review at HTC
- Report to SHOT/MHRA as appropriate

No

Inform medical staff

MODERATE
- Temperature ≥ 39°C or rise of ≥ 2°C and/or
- Other symptoms/signs apart from pruritus/ rash only

- Consider bacterial contamination if the temperature rises as above and review patient's underlying condition and transfusion history
- Monitor patient more frequently e.g. TPR, BP, oxygen saturations, urinary output

- Not consistent with condition or history
- Discontinue (do not discard implicated unit/s)
- Perform appropriate investigations (see Table 1)

If consistent with underlying condition or history, transfusion can be continued at same or slower rate with appropriate symptomatic treatment.

MILD
- Isolated temperature ≥ 38°C and rise of 1-2°C and/or
- Pruritus/ rash only

- Continue transfusion
- Consider symptomatic treatment (see text)
- Monitor patient more frequently as for moderate reactions
- If symptoms/signs worsen, manage as moderate/severe reaction (see left)

Continue Transfusion

Transfusion-related event

Transfusion unrelated

Document in notes that no HTT/HTC review/SHOT report necessary

Important stages in management of ATRs

- Recognise adverse reaction has occurred
- Manage immediate clinical problem
- Investigations as required
  - Investigate for red cell incompatibility if there is a severe febrile reaction
  - E.g. CXR if prolonged severe dyspnoea
- Consider management of future transfusions
- Report

Anaphylaxis

- Infant with congenital coagulation deficiency treated with solvent-detergent FFP for cerebral bleed
- No skin rash, unusually
- Hypoxia, hypotension
- Required intubation
- Given adrenaline

Do neonates have more transfusion-related events and reactions?

- Data on 75% of all red cells transfused in England and North Wales in the week beginning 24.02.14
- Neonates receive 1.3% of all red cell units of whatever size

Rates

- IBCT/SRNM all ages: 12 per 100,000 (95% confidence interval 8-17)
- In neonates 29/100,000 (15-57)

In conclusion, contributory factors are:

- Poor communication and lack of checking
- Failure to recognise neonatal special requirements
- Failure to prescribe volume in mls not units
- Inappropriate transfusion-i.e. prophylactic plasma
- Are all red cell transfusions appropriate?

Final questions

- Are all neonatal reactions recognised and reported?
- What do we know of benefits vs risks?

The approach to neonatal transfusion should be as careful as it is to neonatal prescribing

Any questions?