

# **SHOT 2010 and improving patient safety through interventions based on SHOT data**

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6 July 2011**



# SHOT

- **S**erious
- **H**azards
- **O**f
- **T**ransfusion



# SHOT Aims

- To improve standards of hospital transfusion practice
- To inform policy with UK Blood Services
- To aid production of clinical guidelines
- To educate users on transfusion hazards and their prevention

***SHOT's mission is to improve patient safety***

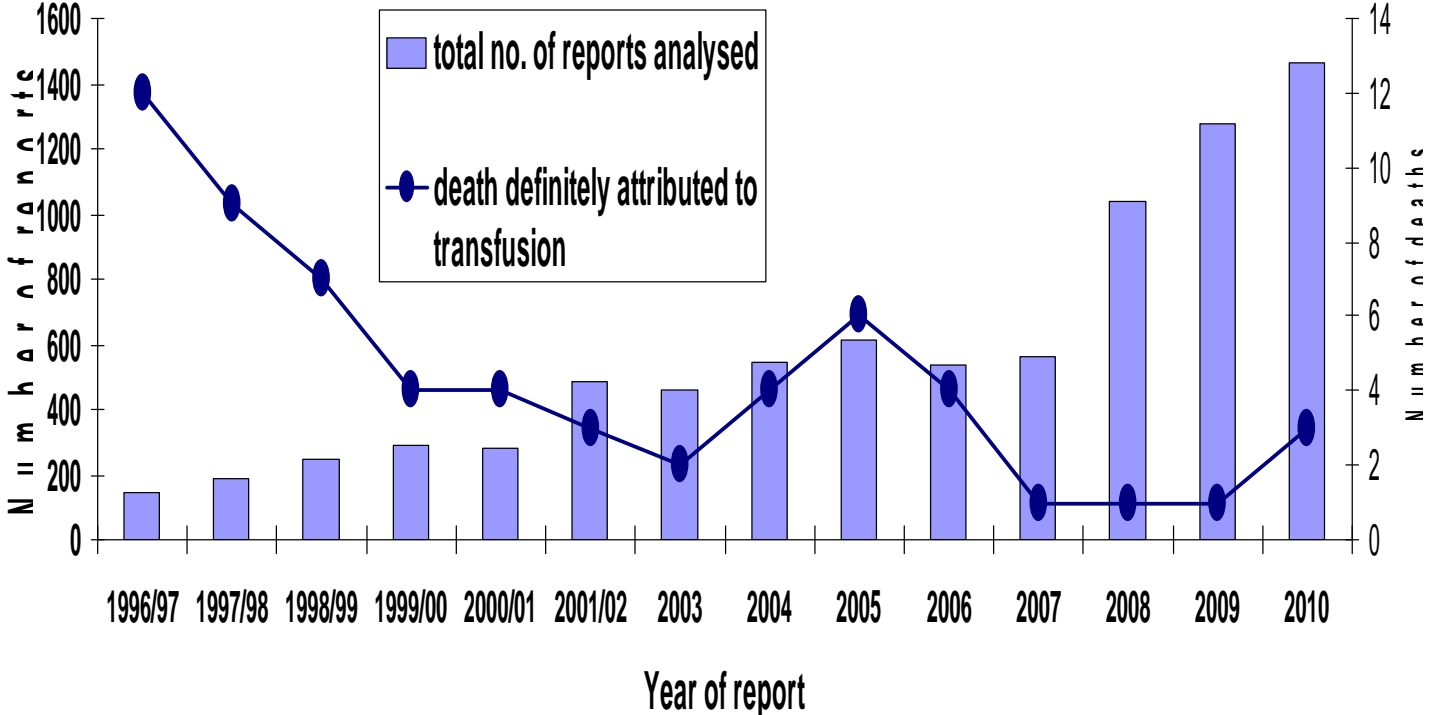


# This talk....

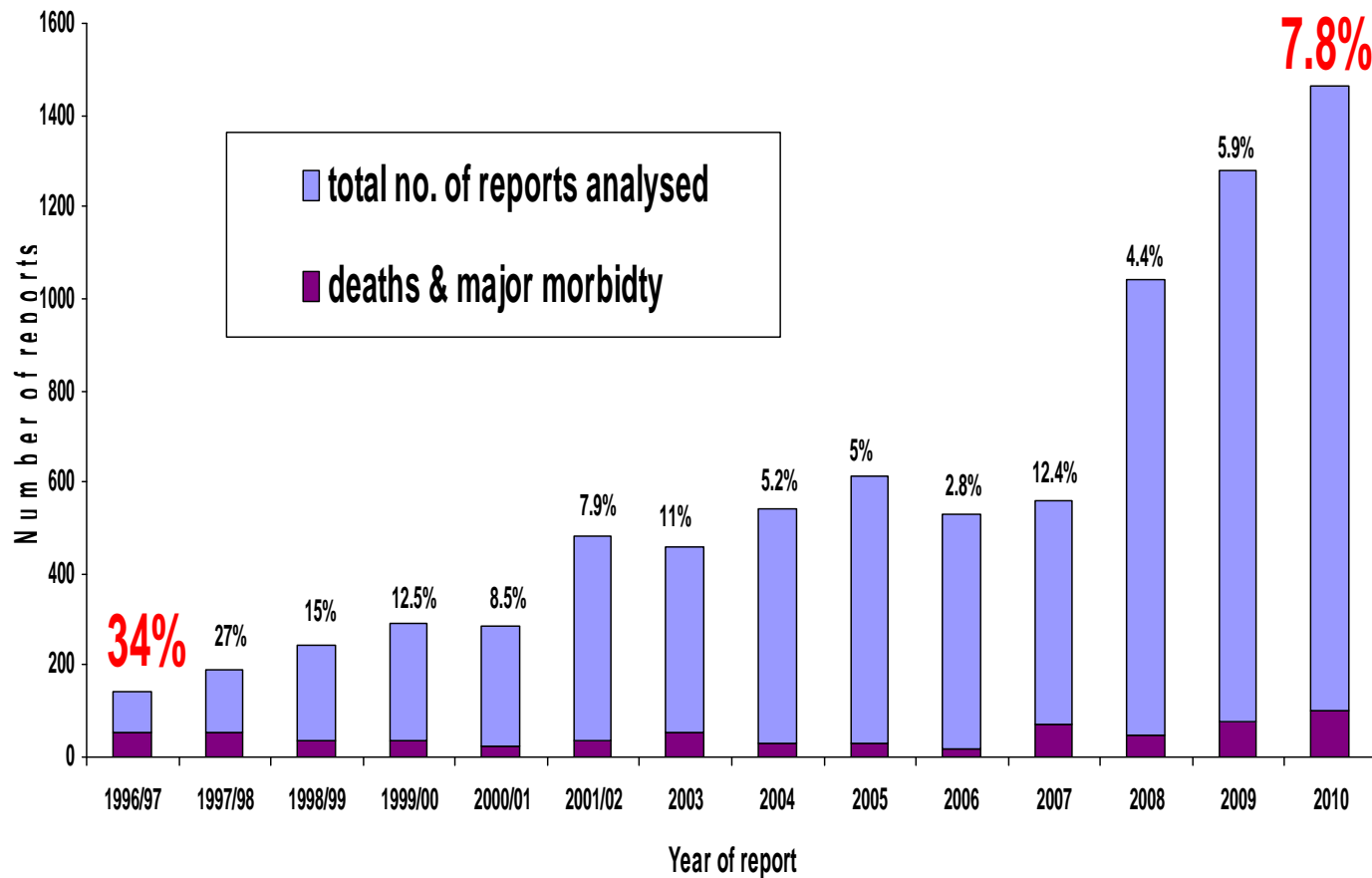
- Improvements in patient safety through interventions based on SHOT data
- SHOT 2010



# Deaths definitely attributed to transfusion 1996/97 - 2010



# Deaths and major morbidity (i.e. serious outcomes): percentage of total reports 1996/97 - 2010



# Improvements in patient safety

1. Reduction in mortality and major morbidity
  - hallmark of an effective haemovigilance system



# Recommendations 1997-1998

- SHOT reporting should be made a requirement of CPA

**Participation is the key to  
successful haemovigilance**



# Reporting to SHOT: now a requirement

- Clinical Pathology Accreditation (CPA UK) Standard H2
- National Patient Safety Agency (NPSA) Safer Practice Notice SPN 14
- Health Service Circular (HSC) 2007/001 Better Blood Transfusion, Standard 4b.3
- Welsh Assembly Government, Healthcare Standards for Wales, Standard 16



# PARTICIPATION

## 1996/97

- 94/424 hospitals  
22%
- Issued with 3.16 million blood components from UKTS
- 141 analysed reports

## 2010

- 208 hospitals/trusts  
94.7%
- Issued with 2.9 million\* blood components from UKTS
- 1464 analysed reports  
+863 near misses  
+137 RBRP

\*Includes 57,487 SD-FFP

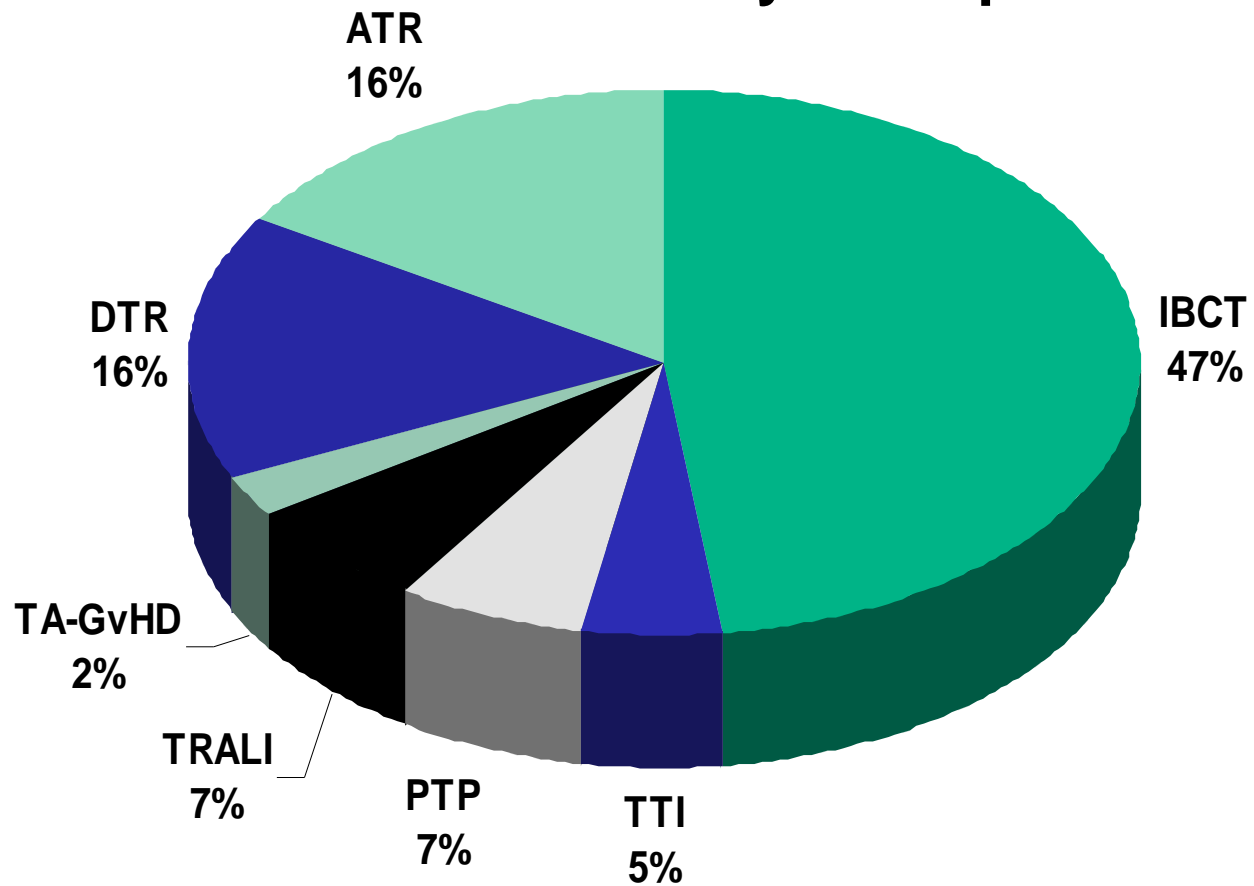
# IBCT

**Largest reporting category**



# SHOT 1996-97

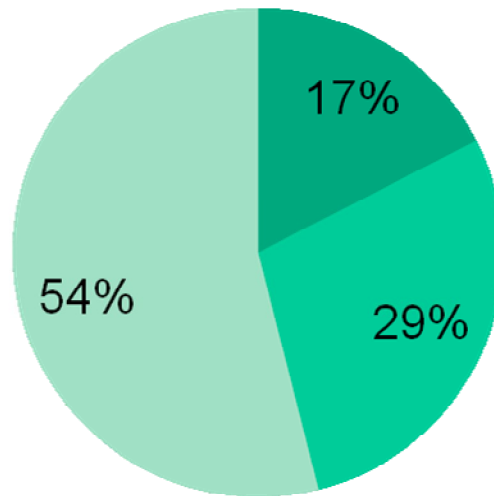
141 analysed reports



# IBCT events 1996/97 n = 63

## Source of error

- Patient sampling and request
- Hospital transfusion laboratory
- Collection and administration



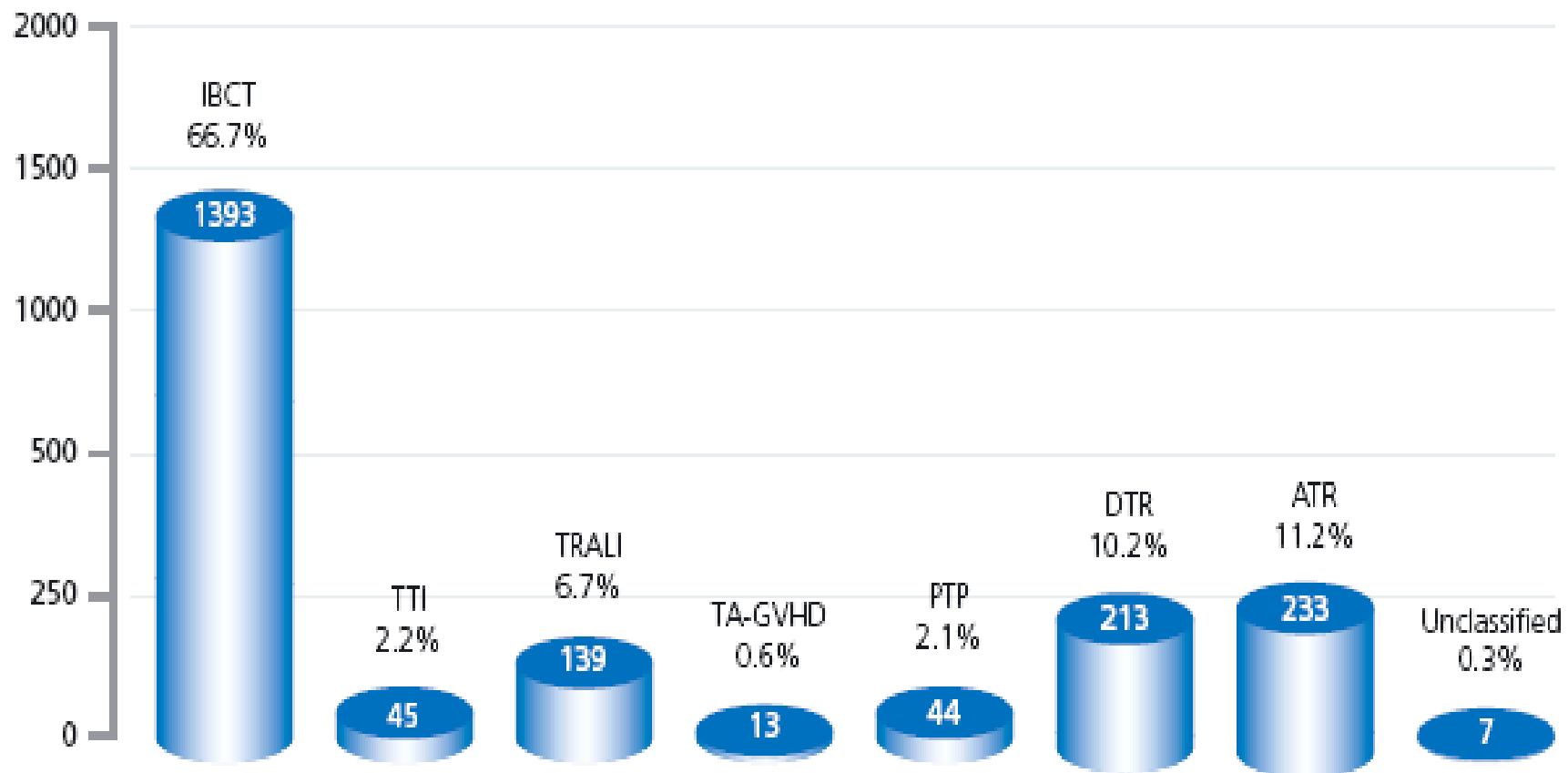
# 1996/97 recommendations

- National standard for minimal formal identification requirement when component is collected and staff training
- The bedside check is vital in preventing error

**BCSH guidelines on administration of blood components 1999 and 2009**

**'Better Blood Transfusion' initiatives – NBTCs Health Service Circulars 1998 - 2007**

# 2087 incidents reported to SHOT 1996/97 - 2003



# Professor Sir John Lilleyman



# Professor Sir John Lilleyman



1. ~70% of IBCT due to clinical errors

# Professor Sir John Lilleyman



2. Failure to check the patient identity at the bedside is the commonest single point of failure

**SHOT 1999 – 2003:**  
221 errors in 130 ABO  
incompatible transfusions:  
59% (131):

- collection of the wrong unit of blood and/or
- administration to the wrong patient

# NPSA SPN 14 – Nov 2006

## ‘Right patient, right blood’

The Chief Medical Officer's  
National Blood Transfusion Committee

NHS  
National Patient Safety Agency

**SHOT**

## Safer practice notice

14

N

### Notice

9 November 2006

**Right patient, right blood**

Blood transfusions involve a complex sequence of activities and, to ensure the right patient receives the right blood, there must be strict checking procedures in place at each stage.

An initiative has been launched that offers a range of long and short term strategies to ensure blood transfusions are carried out safely. The National Patient Safety Agency (NPSA), the Chief Medical Officer's National Blood Transfusion Committee (NBTC) and Serious Hazards of Transfusion (SHOT) have collaborated to develop and evaluate these strategies.<sup>1</sup>

Administering the wrong blood type (ABO incompatibility) is the most serious outcome of error during transfusions. Most of these incidents are due to the failure of the final identity checks carried out between the patient (at the patient's side) and the blood to be transfused.

SHOT data have shown that between 1996 and 2004, five patients died as a direct result of being given ABO incompatible blood. ABO incompatibility contributed to the deaths of a further nine patients and caused major morbidity in 54 patients.<sup>2</sup>

**Action for the NHS and the independent sector**

By May 2007, all NHS and independent sector organisations responsible for administering blood transfusions in England and Wales should have:

- 1 Agreed to and started to implement an action plan for competency-based training and assessment for all staff involved in blood transfusions.
- 2 Ensured that the compatibility form (or equivalent) and patient notes are not used as part of the final check at the patient's side. They should comply with their blood transfusion policy which stipulates that the final identity check must be done next to the patient by matching the blood pack with the patient's wristband (or identity band/photo identification card).
- 3 Systematically examined their local blood transfusion procedures, using formal risk assessment processes, and appraised the feasibility and relevance of using:
  - a bar codes or other electronic identification and tracking systems for patients, samples and blood products (a clinical transfusion management system);
  - b photo identification cards for patients who undergo regular blood transfusions;
  - c a labelling system of matching samples and blood for transfusion to the patient concerned.

<p><b>Immediate action</b> <input type="checkbox"/></p> <p><b>Action</b> <input checked="" type="checkbox"/></p> <p><b>Update</b> <input type="checkbox"/></p> <p><b>Information request</b> <input type="checkbox"/></p> <p>Ref: NPSA/2006/14</p>	<p><b>For response by:</b></p> <ul style="list-style-type: none"> <li>• NHS and independent sector organisations responsible for administering blood transfusions in England and Wales</li> <li><b>For action by:</b></li> <li>• Chief executives</li> <li><b>The NBTC recommends NHS organisations refer to:</b></li> <li>• Working documents</li> <li>• Medical directors</li> <li>• Transfusion guidelines</li> </ul>	<p><b>For response by:</b></p> <ul style="list-style-type: none"> <li>• Clinical governance leads</li> <li>• Blood transfusion service</li> <li>• Staff in England</li> <li>• Senior managers</li> <li>• Hospital transfusion committees</li> <li><b>The NPSA has informed:</b></li> <li>• Chief executives/medical directors and clinical governance leads of strategic health authorities (England) and regional offices (Wales)</li> <li>• NHS Blood and Transplant</li> <li>• NHS Blood and Transplant Regional Blood Transfusion Committees</li> <li>• Healthcare Commission</li> <li>• Healthcare Inspectorate Wales</li> <li>• NHS Foundation and Health Agency</li> <li>• Welsh Health Specialised Services</li> <li>• Hospital Clinics and professional bodies</li> <li>• NHS Direct</li> <li>• Relevant patient organisations and transfusion health groups in Wales</li> <li>• Independent Healthcare Providers Services</li> </ul>
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- 1 Training and competency assessment for all staff involved in blood transfusions
- 2 Compatibility form and patient notes **not** used as part of the final identity check – match blood pack with the patient's wristband (or identity band/photo identification card)
- 3 Appraise the feasibility and relevance of using:

# NPSA Safer Practice Notice 14

## *Patient identification*



Photo identification cards for patients having regular blood transfusions

If you have to go to hospital for regular blood transfusions, you can now have a permanent identification card

Name of hospital  
Hospital number  
Other  
First name  
DOB  
Gender  
Patient Identification - NOT STAFF

Anytown  
Anywhere trust

NHS

right patient  
right blood

**Further information**

For further information and advice, please contact:  
Insert trust contact details including trust blood transfusion practitioner and the blood transfusion department

**NHS**  
National Patient Safety Agency

**Blood transfusion red label system: the process of matching blood sample to patient**

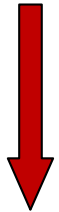
Staff guidance on group and save, and cross-match sampling

Blood Transfusion Department  
[Insert contact numbers]

# NPSA SPN 14

## Right patient, right blood

Main aims



IBCT

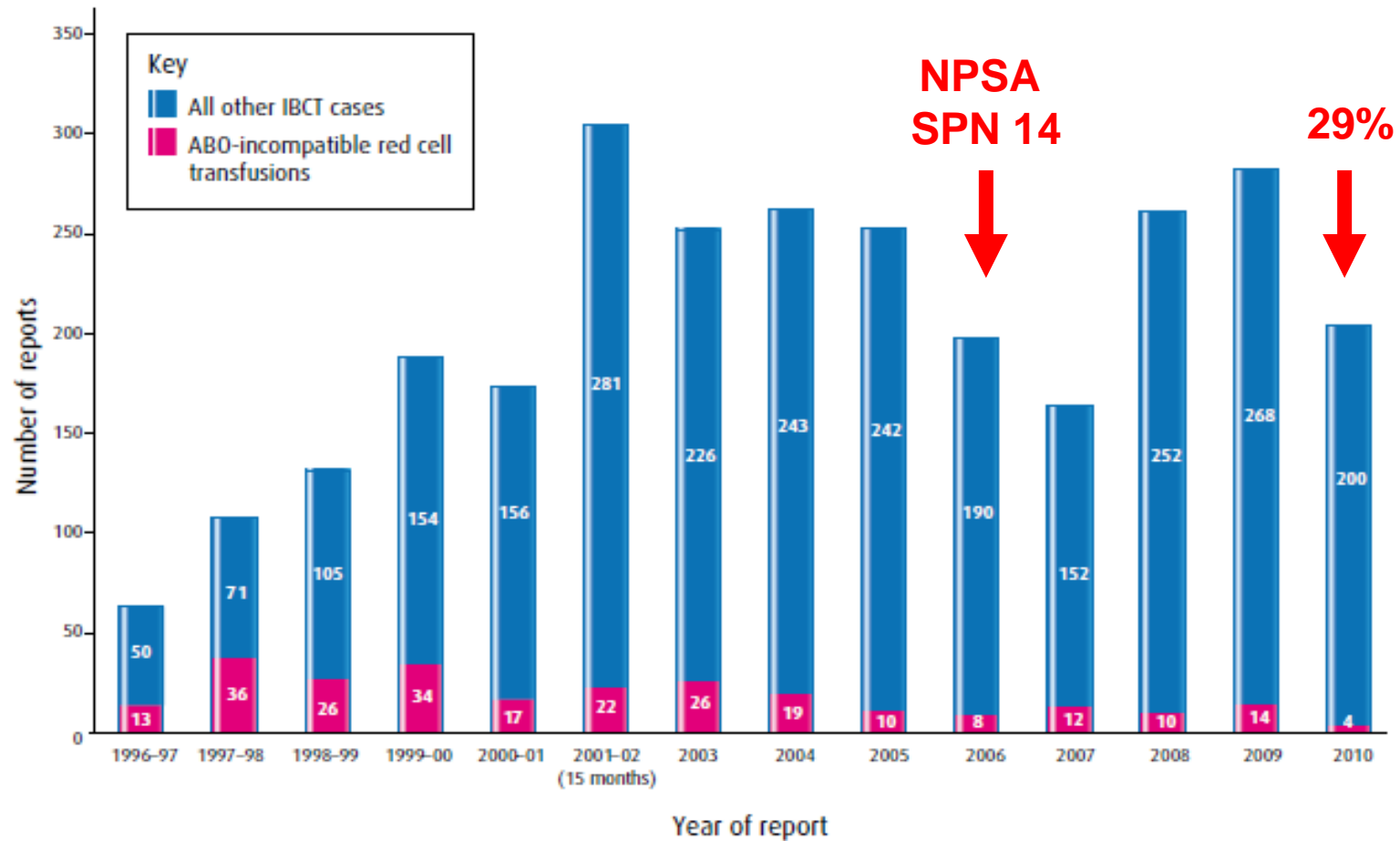


ABO incompatible transfusions

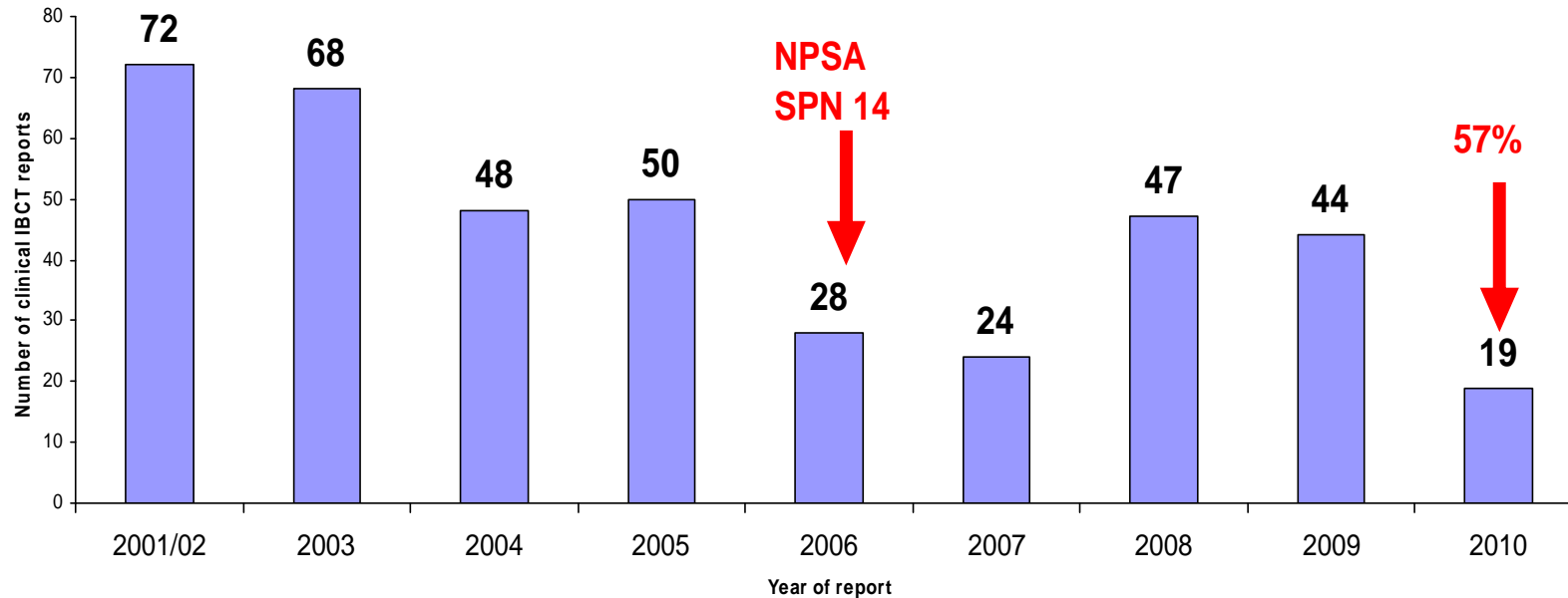
Over 5 years



Figure 4  
 IBCT cases 1996–2010 showing ABO-incompatible red cell transfusions

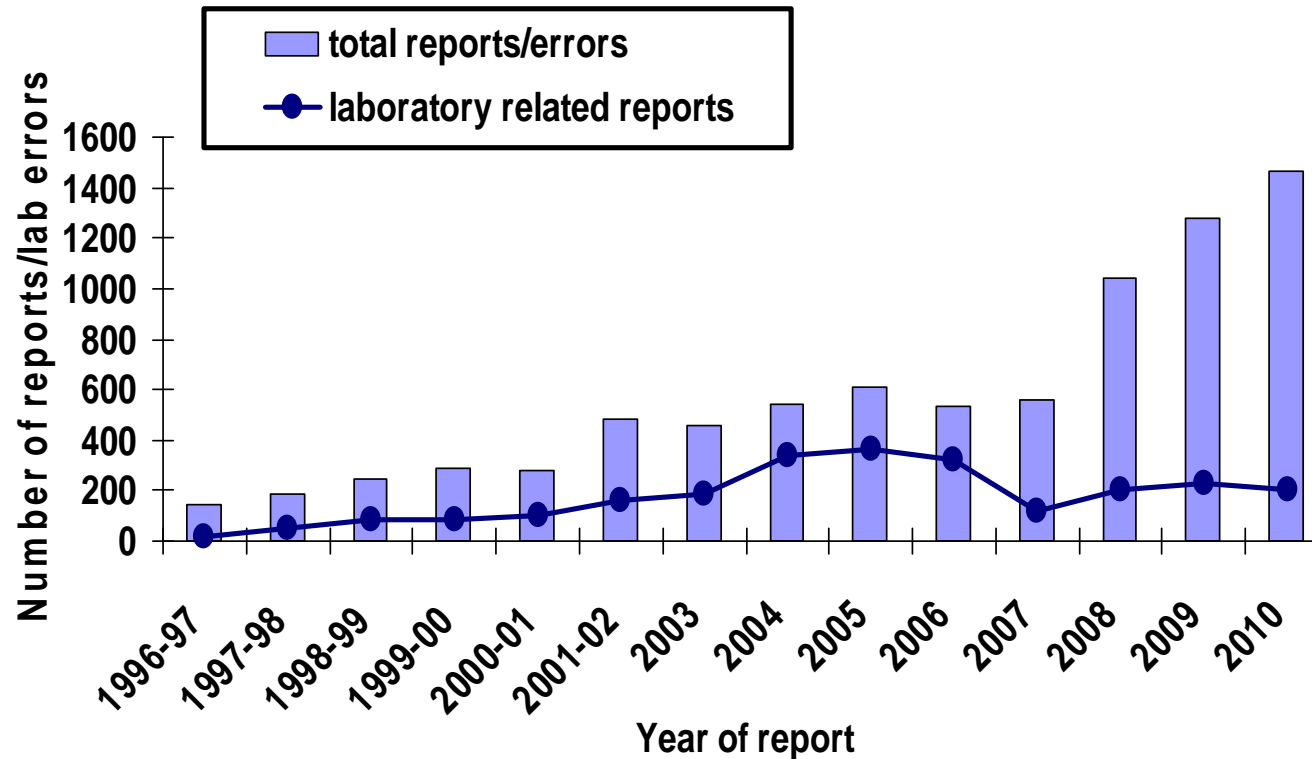


# Clinical 'wrong blood' reports 2001/02 - 2010



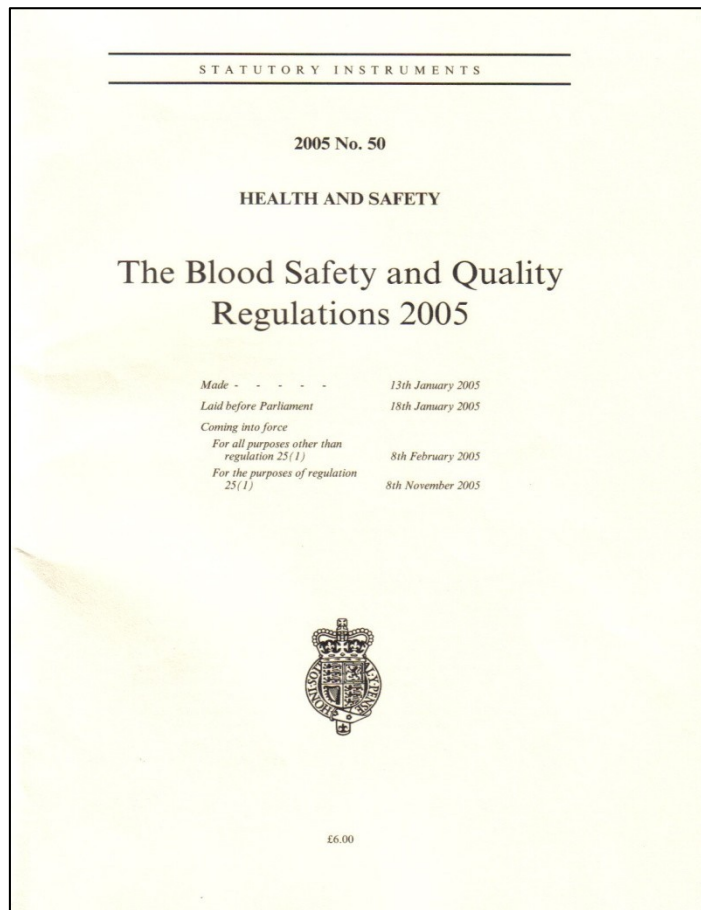
**Clinical 'wrong blood' reports reduced  
by 57% from 2009 to 2010**

# Total laboratory errors 1996/97 - 2010



**28% fall in IBCT cases where primary error occurred in the laboratory: 107 in 2010 vs. 149 in 2009**

# Fall in laboratory errors



*Transfusion Medicine*, 2009, 19, 156–158

doi: 10.1111/j.1365-3148.2009.00938.x

## GUIDELINES

### UK Transfusion Laboratory Collaborative: Recommended minimum standards for hospital transfusion laboratories

B. Chaffe, J. Jones, C. Milkins, C. Taylor, D. Asher, H. Glencross, M. Murphy & H. Cohen *on behalf of the UK Transfusion Laboratory Collaborative, c/o SHOT Office, Manchester, UK*

*Received 25 March 2009; accepted for publication 25 March 2009*

- Recommended minimum standards for hospital transfusion laboratories 2009
- Address staffing, technology, training and competence

# Improvements in patient safety

- Reduction in mortality and major morbidity
  - hallmark of an effective haemovigilance system
- Reduction in ABO incompatible transfusions; 29% reduction in IBCT: 57% in clinical areas and 28% less in the laboratory



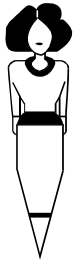
# TRALI

## Transfusion-related acute lung injury

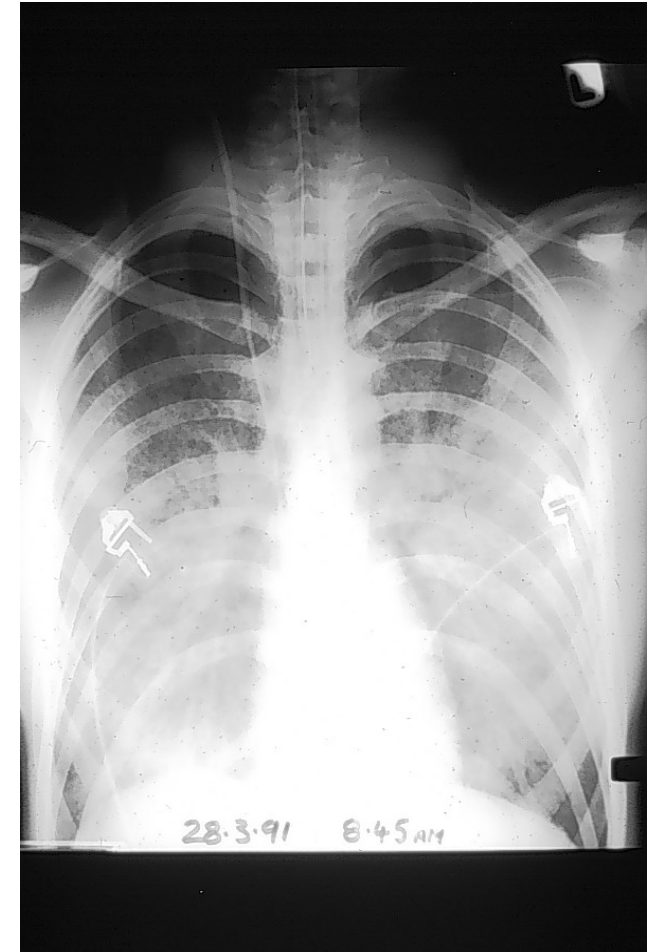


# TRALI

- Leading cause of transfusion-related mortality and major morbidity
- Caused by HLA/HNA abs – main source is donor plasma:



- A donor with a history of transfusion (excluded since April 2004 unless Tx pre 1980 only)
- A female donor with a history of pregnancy – abs in 10-15%



# TRALI – relative risk from different components 1996-2003

	Red cells	Cryoppt	FFP / Cryosup	Platelets
TRALI cases	33	2	31	27
Components issued	18,370,000	634,000	2,515,000	1,842,000
Risk/ component issued	1:556,000	1:317,000	1:81,000	1:68 000
<b>~Relative risk compared to red cells</b>	<b>-----</b>	<b>2</b>	<b>7</b>	<b>8</b>



# Recommendations 2001-2002

- UK transfusion services should take all steps possible to reduce the risk of TRALI from blood components especially FFP and platelets



# Intervention to reduce the risk of TRALI



# Intervention to reduce the risk of TRALI



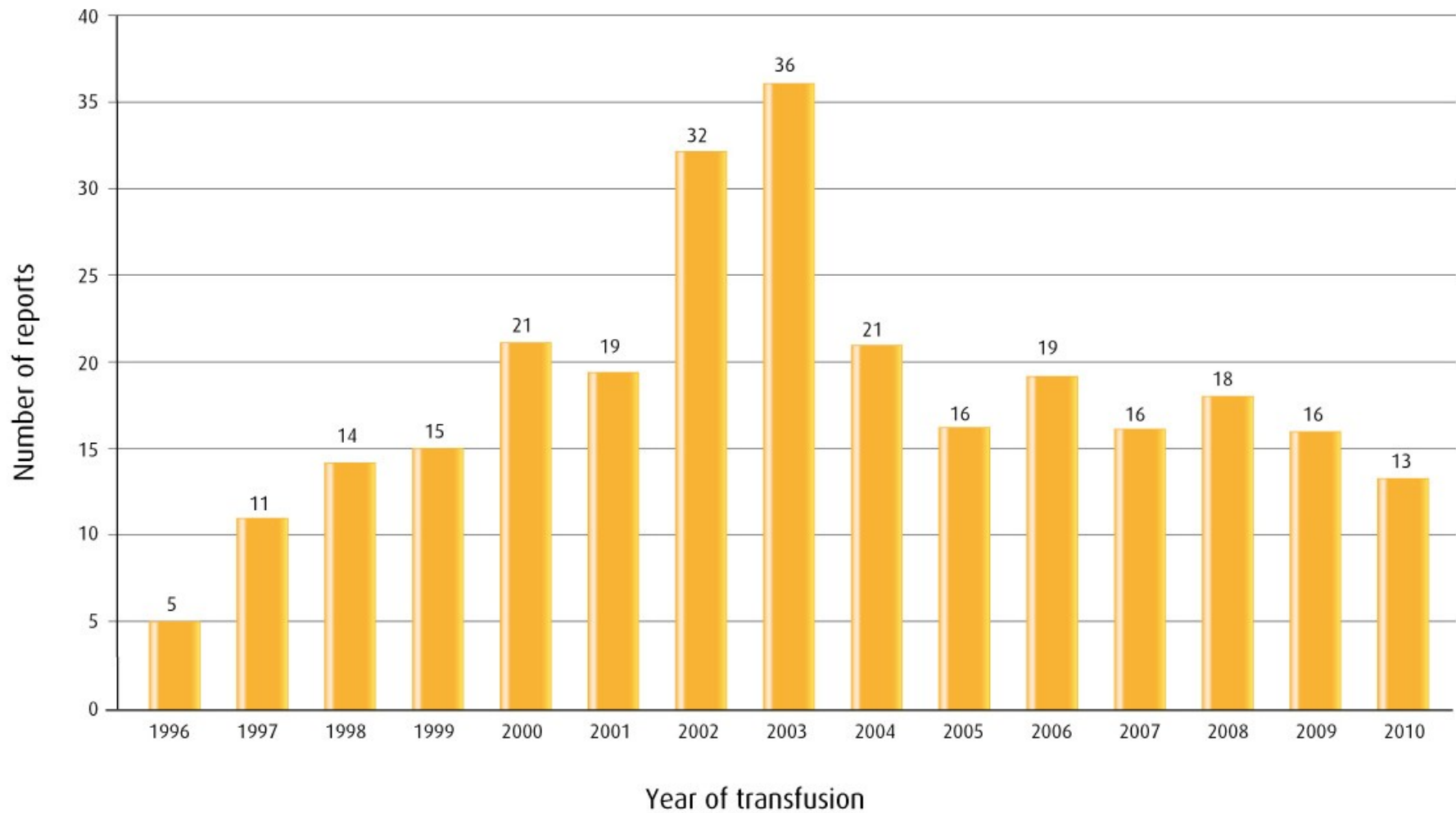
**‘Please- no more new questions for donors!!’**  
Decision ‘Male FFP as far as possible’.

**October 2003**

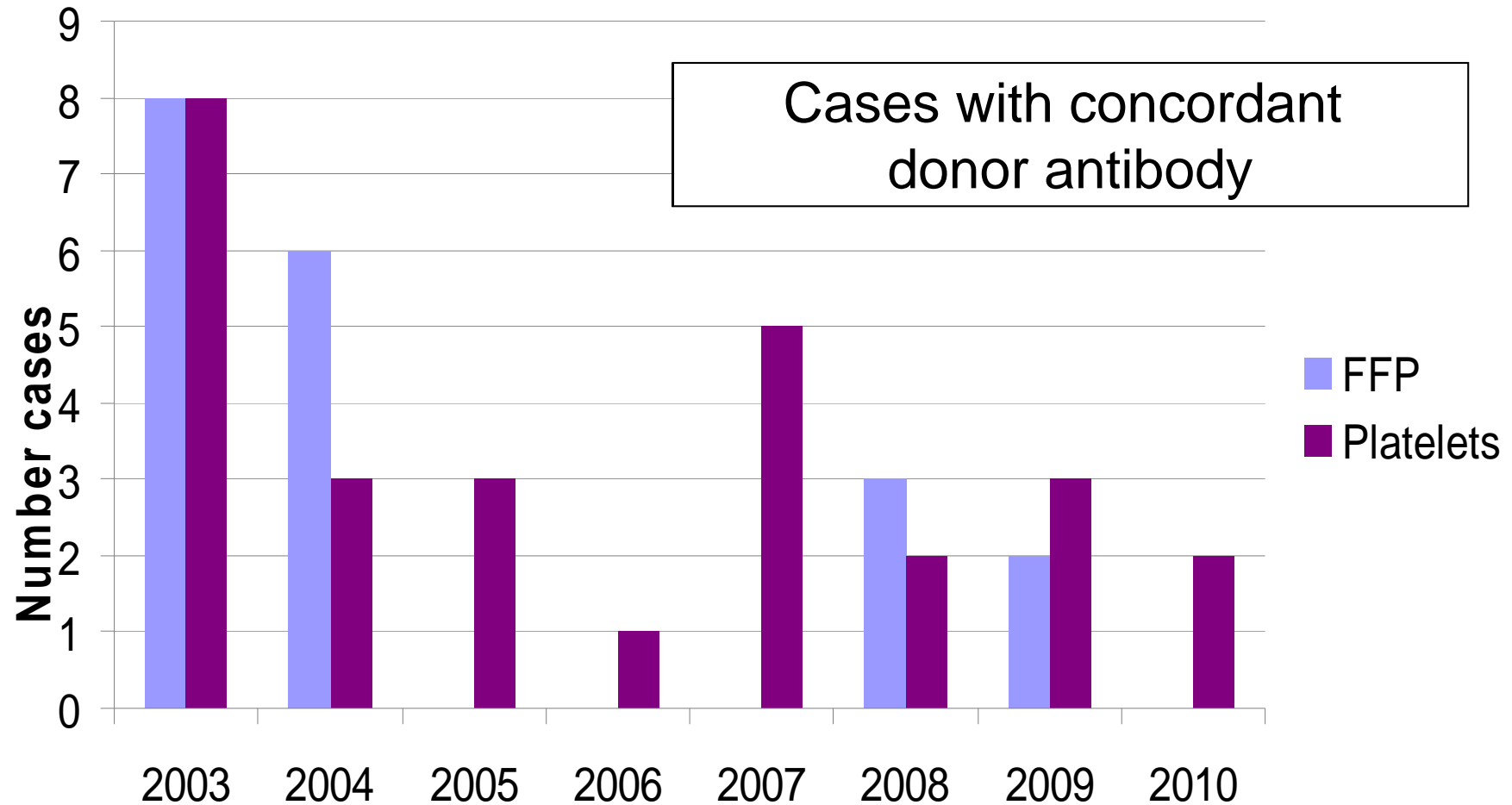
- Male donations marked M - to FFP
- Female donations marked F- to ‘plasma discard’
- Did NOT swap out female FFP stocks
- April 2004-previously transfused donors excluded (vCJD)



Figure 13  
Number of TRALI cases by year of transfusion



# TRALI – effect of male FFP 2003 - 2010



# Improvements in patient safety

- Reduction in mortality and major morbidity
  - hallmark of an effective haemovigilance system
- Reduction in ABO incompatible transfusions; 29% reduction in IBCT: 57% in clinical areas and 28% less in the laboratory
- Observed rates of TRALI consistently lower since 2003/04
  - But in 2010 female donors implicated in all 4 cases where concordant donor HLA abs found

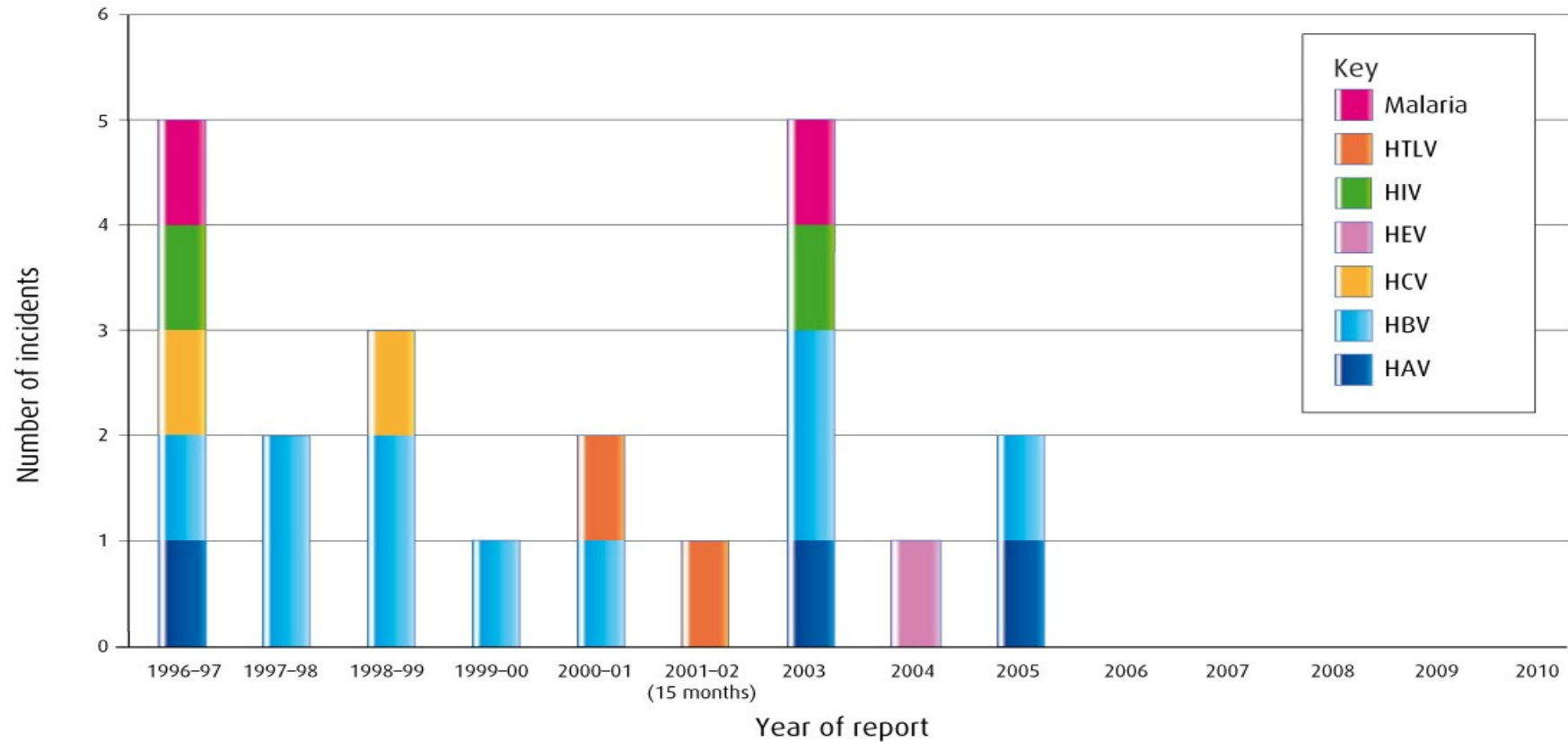


# TTI

## Transfusion-transmitted infection



**Figure 19**  
**Number of viral and parasitic TTI incidents, by year of report and infection type (Scotland included from 10/1998)**



**Current estimated risks in the UK for HBV 1.5, HCV 0.01, HIV 0.20 and HTLV-1 0.06 per million donations**

# Bacterial transmission

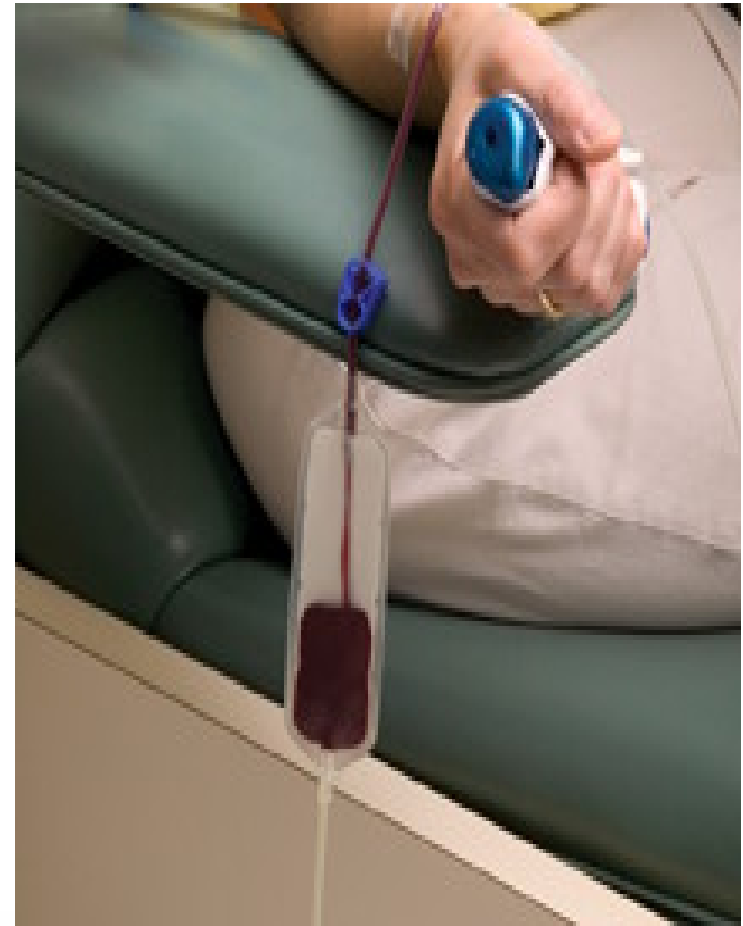
- In 6 years from 1996 to 2002, 24 bacterial transmissions (6 fatal) were reported to SHOT
  - 6 cases in 1998-1999, 5 in 1999-2000



# Recommendation 1999-2000

Strategies to prevent transfusion transmitted bacterial infections should be given priority

- Diversion of first 20mL of blood commenced in 2002



# Other measures to reduce bacterial sepsis

- Donor selection
- Improved donor arm cleaning
- Visual inspection of units
- Screening of platelet donations for bacterial contamination
  - All UKBS screen platelet donations for bacterial contamination

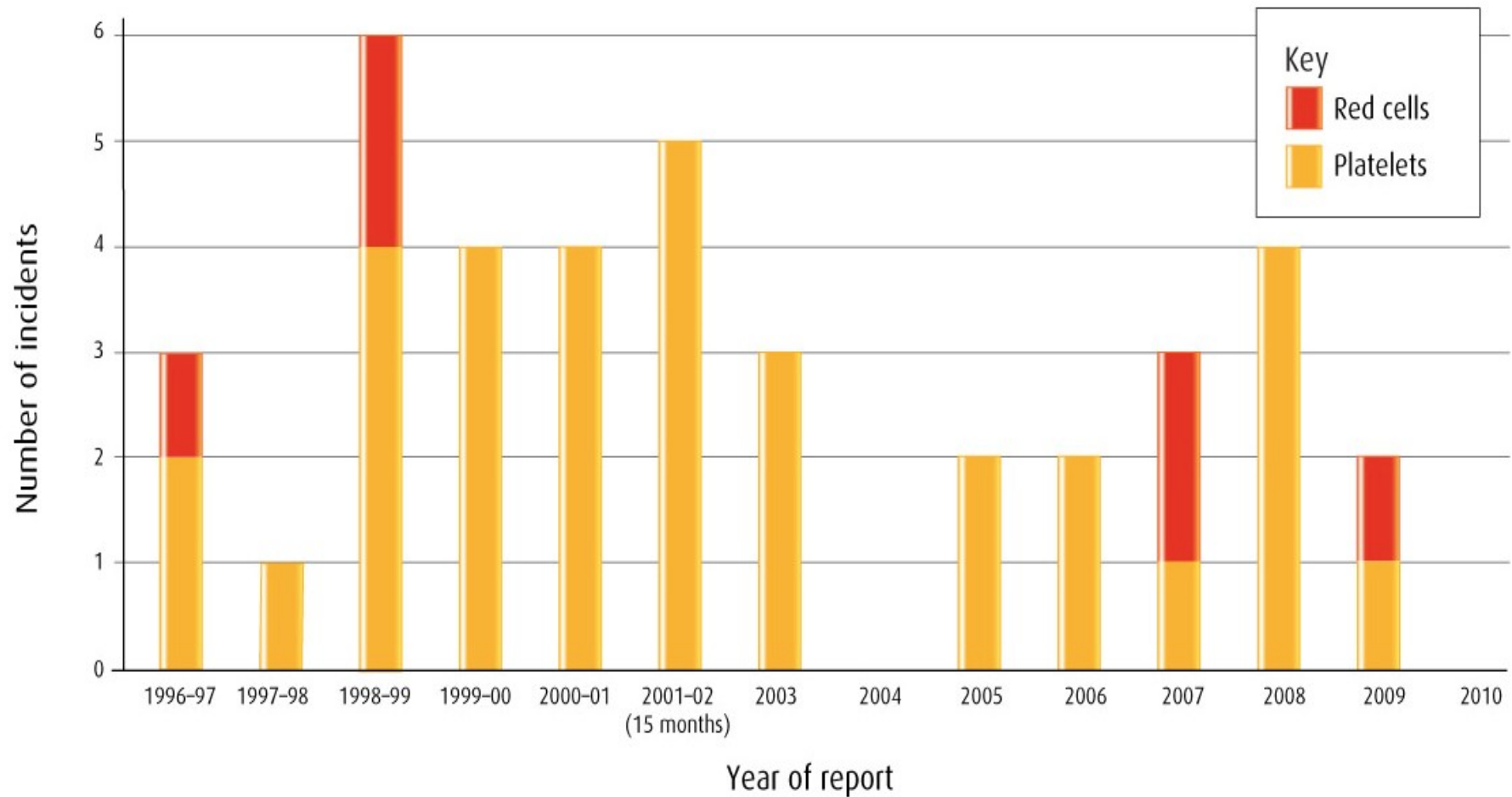
**Currently the greatest risk of TTI is associated with bacterial contamination. Bacterial screening unlikely to prevent all transmissions and current high standards of collection, processing and vigilance should be maintained**

- SaBTO
  - Pathogen inactivation not recommended until further data on cost and benefit available



Figure 18

Number of bacterial TTI incidents, by year of report and type of unit transfused (Scotland included from 10/1998)



# SHOT recommendations

1996/97

Need for a national body with relevant expertise and resource to advise government of priorities for improvement in blood safety

**MSBTO → SaBTO 2007**

**SHOT aspires to integrated risk-based decision making with patient safety at its core**



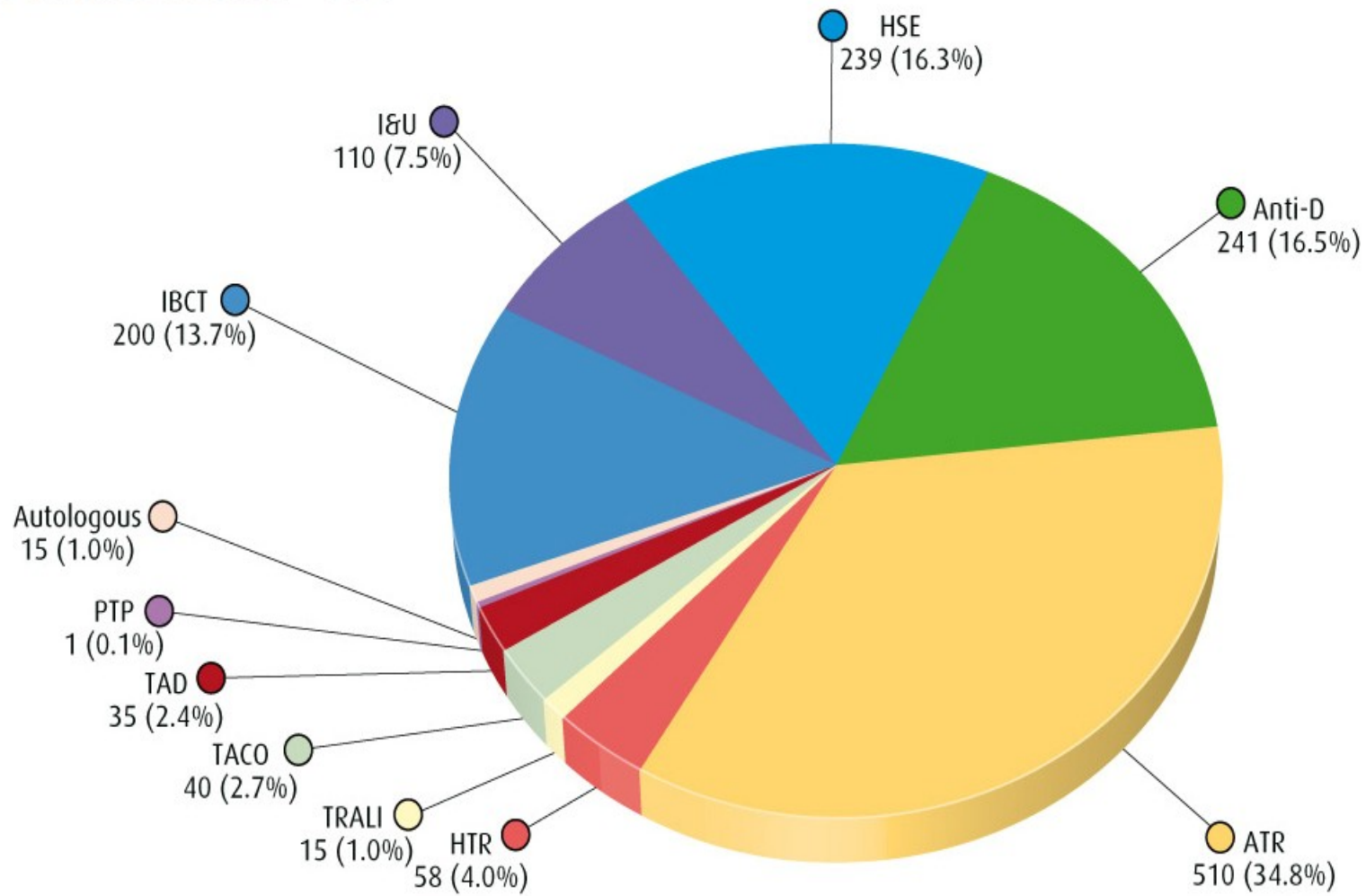
# This talk....

- Improvements in patient safety through interventions based on SHOT data
- **SHOT 2010**



Figure 2

Cases reviewed in 2010  $n = 1464$



# SHOT 2010 Headlines

- Participation 94.7%
- No confirmed cases of TTI
- 29% reduction in IBCT: 57% in clinical areas and 28% less in the laboratory
- TACO and I&U responsible for the majority of cases of mortality and major morbidity with imputability  $\geq 2$
- 3 deaths directly caused by transfusion, and transfusion probably or possibly contributed in a further 10
- 101 cases of major morbidity with ATR the single highest cause (57 cases)
- i.e. Serious outcome in 7.8% of cases reported



# SHOT 2010: deaths

- 13 transfusion-related deaths, 7 due to TACO
- 3 imputability 3
  - Sudden unexpected death ATR
  - TACO
  - Hyperhaemolysis in child with SCD
- Remainder
  - 6 due to TACO
  - 1 under-transfusion
  - 2 ATR
    - Septic neonate: cardiac arrest during tx apheresis plts
    - Adult with cerebral tumour developed hypertension and rigors during tx apheresis plts and bled into the tumour
  - 1 TRALI in patient with massive GI bleed who died the same day of cardiorespiratory failure. No serology.



# SHOT 2010 major morbidity

- 101 cases, majority due to ATR
  - 57 cases, 34 with anaphylactic and 1 angioedema, 11 allergic reactions with bronchospasm and 10 severe hypotensive reactions and 1 SVT with a fever
- Pulmonary complications of transfusion
  - 15 patients with TACO, 19 with TRALI and 6 with TAD
- I&U (covered by SK)
- IBCT: 2 cases where 'wrong blood' contributory
- HTR: 2 cases
- Development of anti-D after failure to administer anti-D
- Autologous: Severe coagulopathy after reinfusion of 1110 mL of salvaged blood



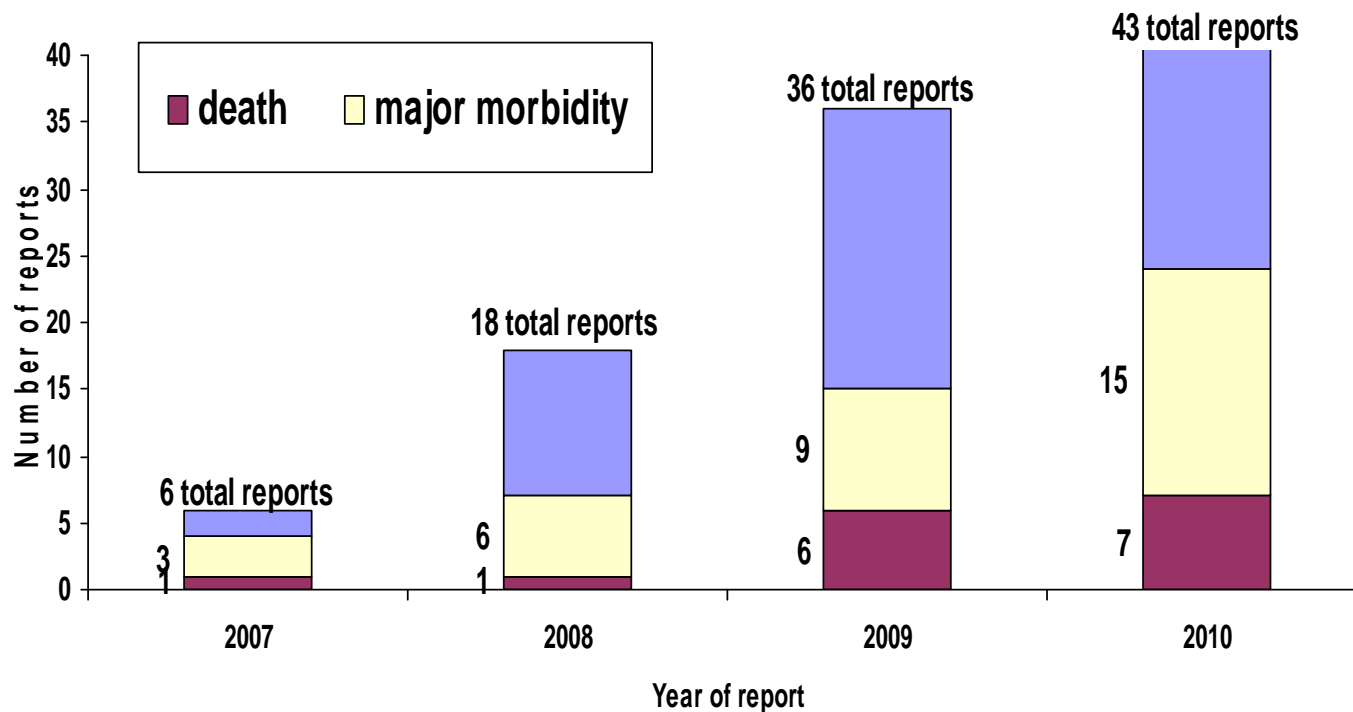
# Lessons and recommendations from the 2010 SHOT report - 1

## The medical assessment and management of patients receiving blood transfusions

- Numerous reports in TACO and I&U chapters have shown that there is inadequate medical assessment of patients during the prescription and monitoring of transfusion episodes



# 15 TACO-related deaths and 33 cases of major morbidity 2007 - 2010



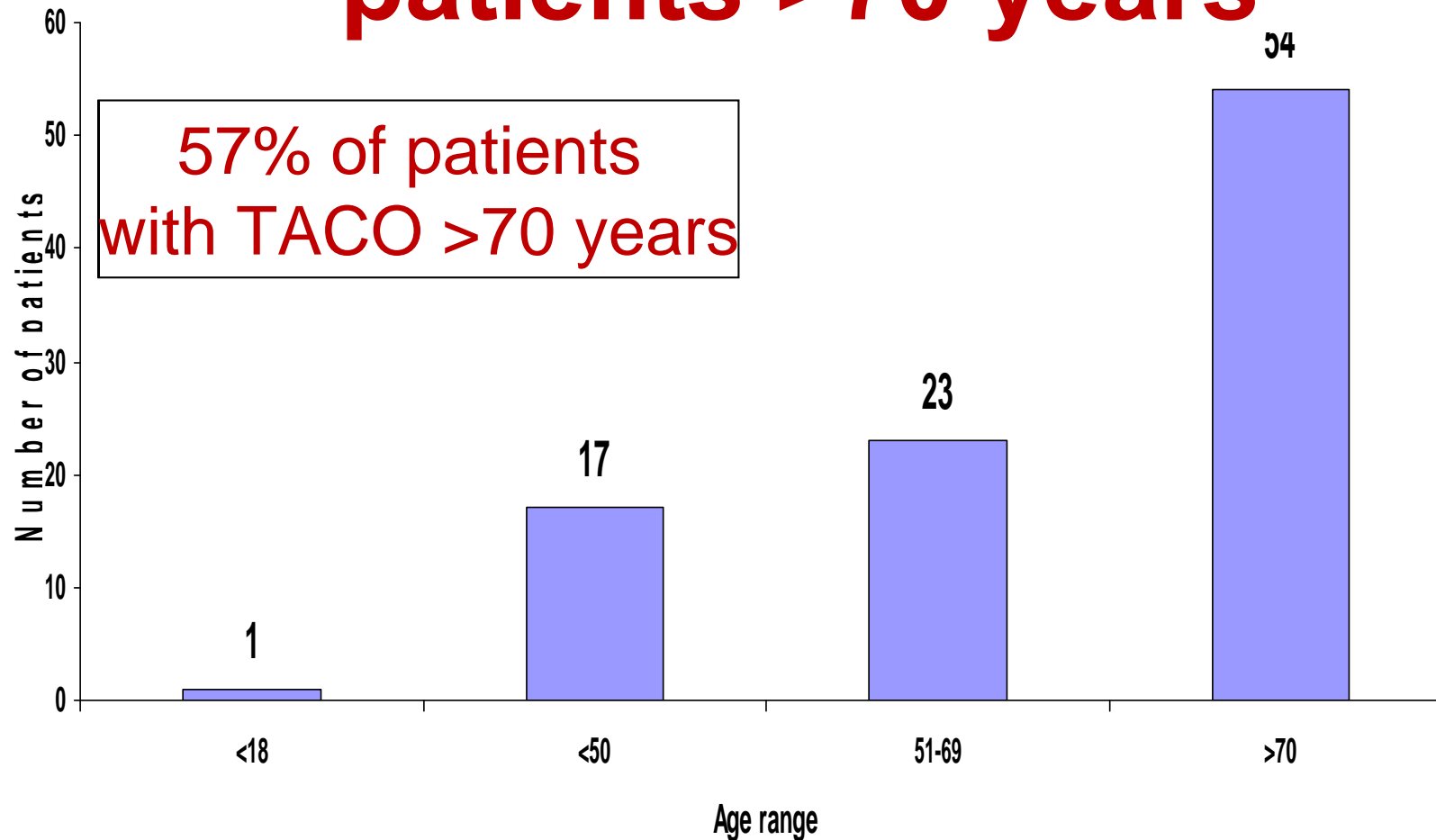
\*Includes 3 deaths and 5 cases of major morbidity from I&U

# TACO: lack of attention to fluid balance.....

A confidential chart with data about fluid balance has been removed from the published version of this presentation, because it forms part of a Poster to be presented at the BBTS ASM 2011



# ....particularly in elderly patients >70 years



# ....and those with conditions that predispose to TACO

*An 84-year-old male with congestive cardiac failure (CCF) associated with IHD, on oral furosemide, isosorbide mononitrate and enalapril, was admitted with melaena. The Hb was 7.9 g/dL. He was transfused 3 units of RBC, each over 3 hours. However, because he was nil by mouth for endoscopy, his oral medication was withheld. No parenteral diuretic was substituted. He developed pulmonary oedema with pO<sub>2</sub> 6.3 kPa, and received CPAP and diuretic therapy, but he died.*

# 2010 main recommendation

- The existing British Committee for Standards in Haematology (BCSH) guidelines for the Administration of Blood Components should be supplemented by an amendment dealing with measures to avoid the development of TACO and over-transfusion, particularly in vulnerable patients, including
  - pre-transfusion clinical assessment
  - rate of transfusion
  - fluid balance, regular monitoring of Hb
  - prescription of diuretics

**Action: BCSH Transfusion Taskforce**



# Lessons and recommendations from the 2010 SHOT report - 2

## Recognition and management of acute transfusion reactions

### Learning point

- Transfusion should only take place if there are sufficient staff available to monitor the patient and the patient can be readily observed throughout the transfusion

### Recommendation

- Transfusions should only be performed where there are facilities to recognise and treat anaphylaxis, according to the UK resuscitation Council guidelines.

Action: Hospital transfusion committees (HTTs)



# Lessons and recommendations from the 2010 SHOT report - 3

## Clinical knowledge and handover

### Main recommendations

- Transfusion medicine must be part of the core curriculum for doctors in training

**Action: Education working groups of national transfusion committees**

- To avoid inappropriate and unnecessary transfusions due to lack of adequate clinical handover, decisions made concerning the need for transfusion support should be documented in the handover templates

**Action: Trusts/hospitals**



# Lessons and recommendations from the 2010 SHOT report - 4

**DH 'never events' list 2011/12** now includes  
'death or serious harm as a result of the inadvertent  
transfusion of ABO-incompatible blood components'

NPSA SPN 14 is having an impact, but

- Only 77% of Trusts have provided competency-based training and assessment for blood administration for 50-91% of staff
- National TP survey: TPs spending vast majority of their time on NPSA SPN 14 and BSQR to detriment of other aspects of transfusion safety or inappropriate use - critical factor in 25% being dissatisfied with their role

# Lessons and recommendations from the 2010 SHOT report - 4

## DH 'never events' list 2011/12 (contd).

### Main recommendation

- There should be a review of the practical aspects of the implementation of NPSA SPN 14 with a view to new guidance being issued and that Trusts should ensure that individual transfusion practitioners are fully supported with the allocation of additional link nurses in the escalation of training and assessment

**Action: NBTC, Trust/hospital chief executive officers (CEOs)**



# Lessons and recommendations from the 2010 SHOT report - 4

## DH 'never events' list 2011/12 (contd).

### Recommendations

- Trusts should implement the recommendations of the UK Transfusion Laboratory Collaborative

**Action: trusts/hospitals**

- Work should continue with suppliers of LIMS to improve the capability of IT systems to generate warning flags and implement component selection algorithms based on data incorporated in the component label. These improvements should be in line with the recommendations of the BCSH guidelines on laboratory IT systems currently in preparation

**Action: Manufacturers of laboratory IT systems**



# Lessons and recommendations from the 2010 SHOT report - 5

## Rapid Response Report NPSA/2010/017

### Recommendations

- All under- and delayed transfusions that have a significant impact on patient outcomes should be reported to SHOT

**Action: hospital transfusion teams (HTTs)**

- The Dendrite database should be enhanced to fully capture the salient clinical features and details of the timeliness of blood component support

**Action: SHOT team**



# Lessons and recommendations from the 2010 SHOT report - 6

## Haemolytic transfusion reactions in sickle cell disease

### Learning points

- A hyperhaemolytic transfusion reaction (in which both autologous and transfused red cells are destroyed) should be suspected if the patient rapidly develops a more marked anaemia than was present pre-transfusion.

Further transfusion should be avoided if possible, since this may exacerbate the haemolysis and lead to a protracted course or even death. Expert advice should be sought from a specialist sickle cell disease unit or a Blood Service transfusion medicine specialist

- A delayed HTR should be considered in the differential diagnosis of patients with sickle cell disease presenting with an apparent haemolytic crisis up to 14 days post transfusion



# Thanks

- Dr Sue Knowles, SHOT Medical Director
- Steering Group and Working Expert Group
- Writing Group
- Debbi Poles – Research Analyst
- Alison Watt – Operations Manager
- Hema Mistry – Laboratory Incidents Specialist
- Julie Ball – Clinical Incidents Specialist
- Tony Davies – SHOT transfusion liaison practitioner
- Kathryn Gradwell and Vicky Peake, SHOT office information officers
- UK Forum for funding
- ***Hospital transfusion teams for reporting!***

