FIGURES FROM THE ANNUAL SHOT REPORT 2018

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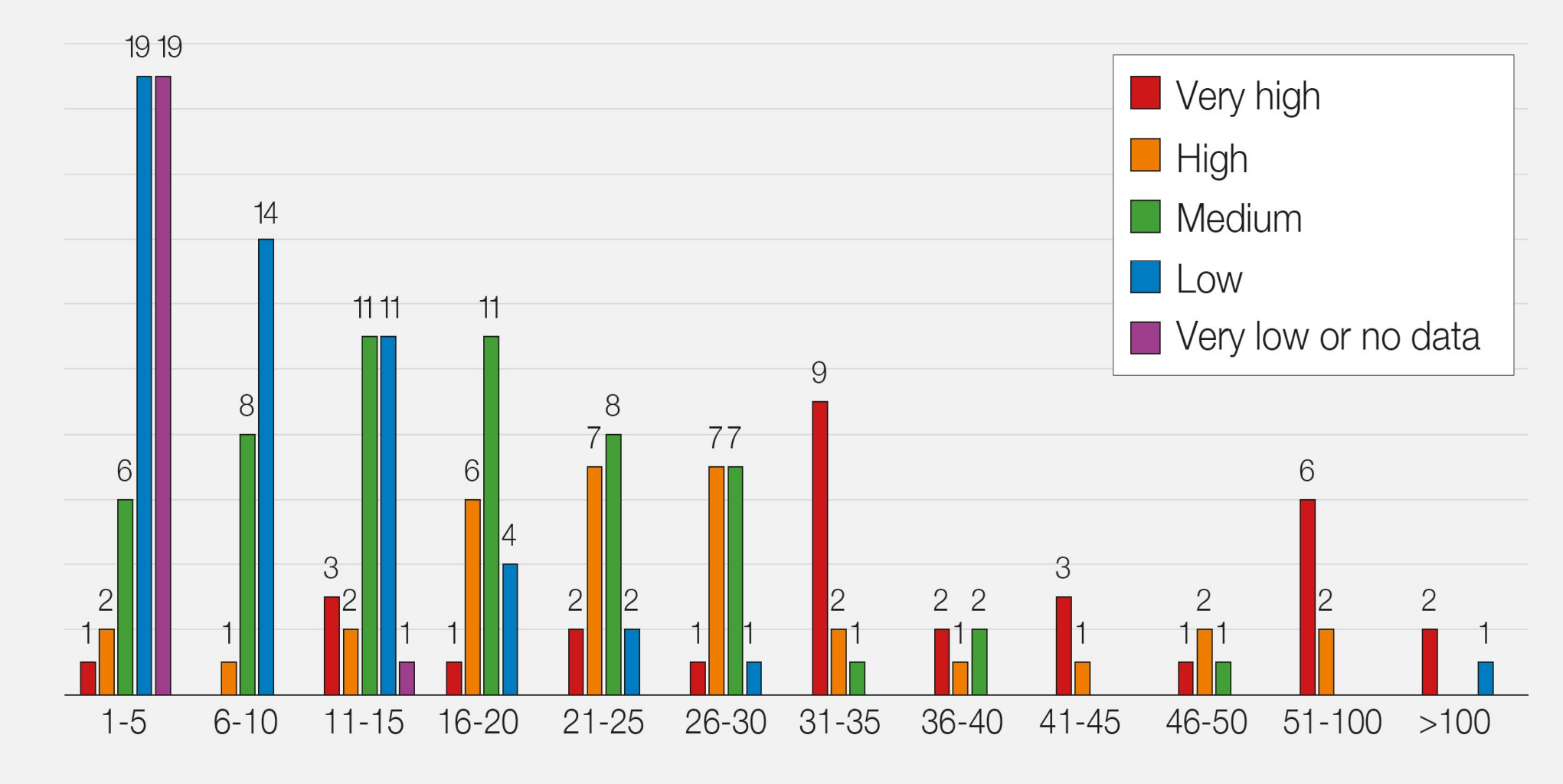
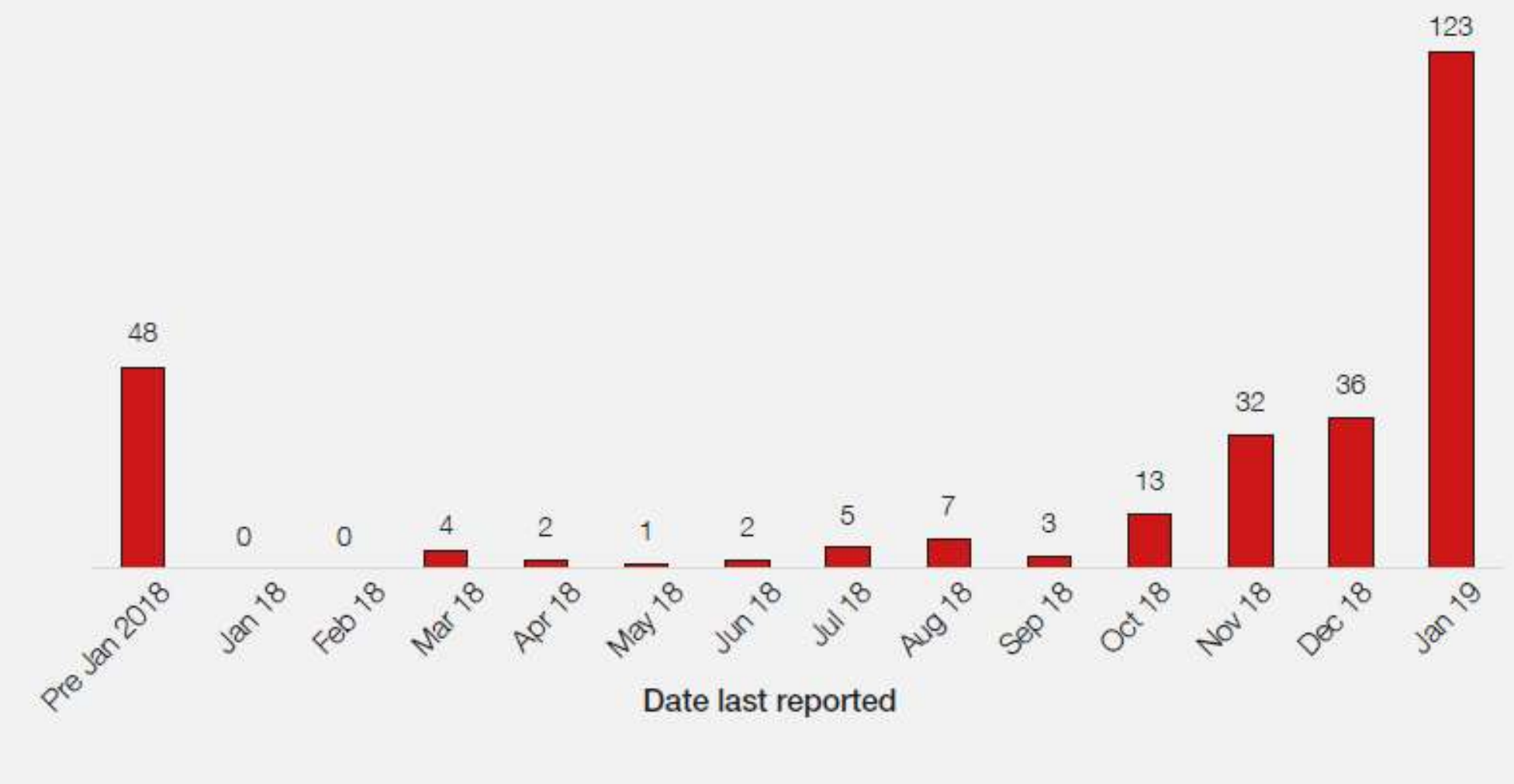
SHOT Serious Hazards of Transfusion

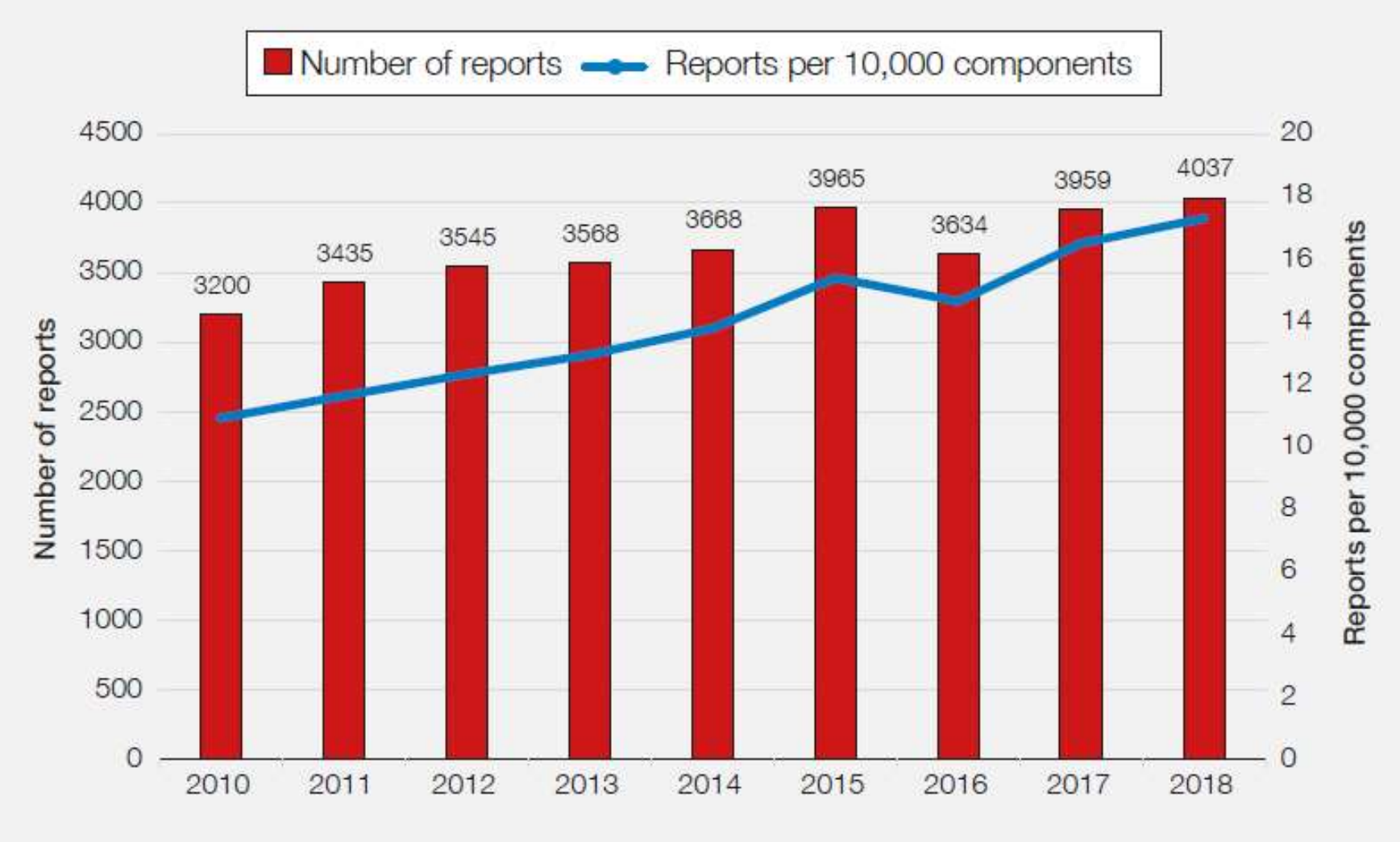
Number of 2018 reports by reporting organisation and component usage level



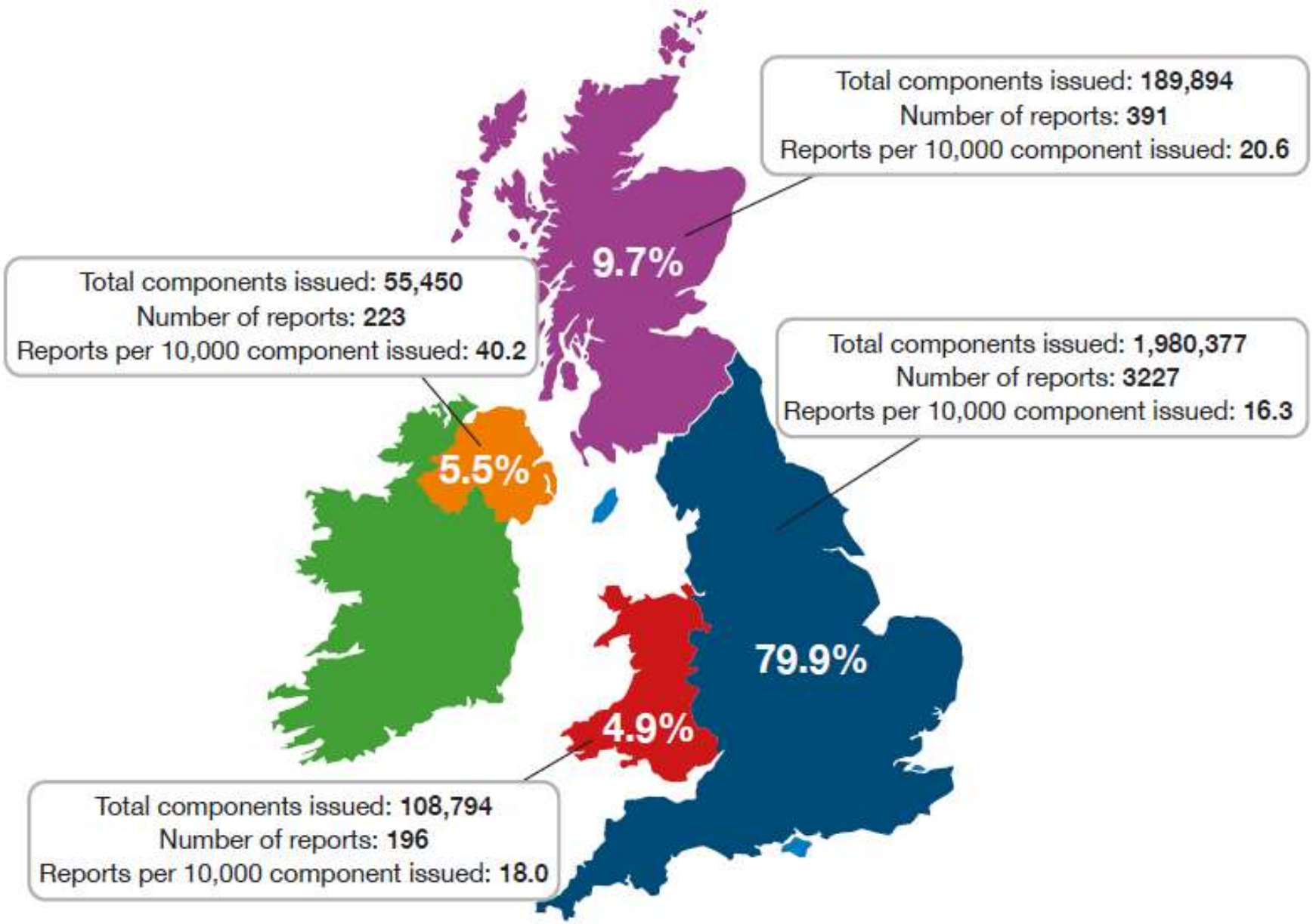
The last time a report was received on SABRE from an active SABRE account



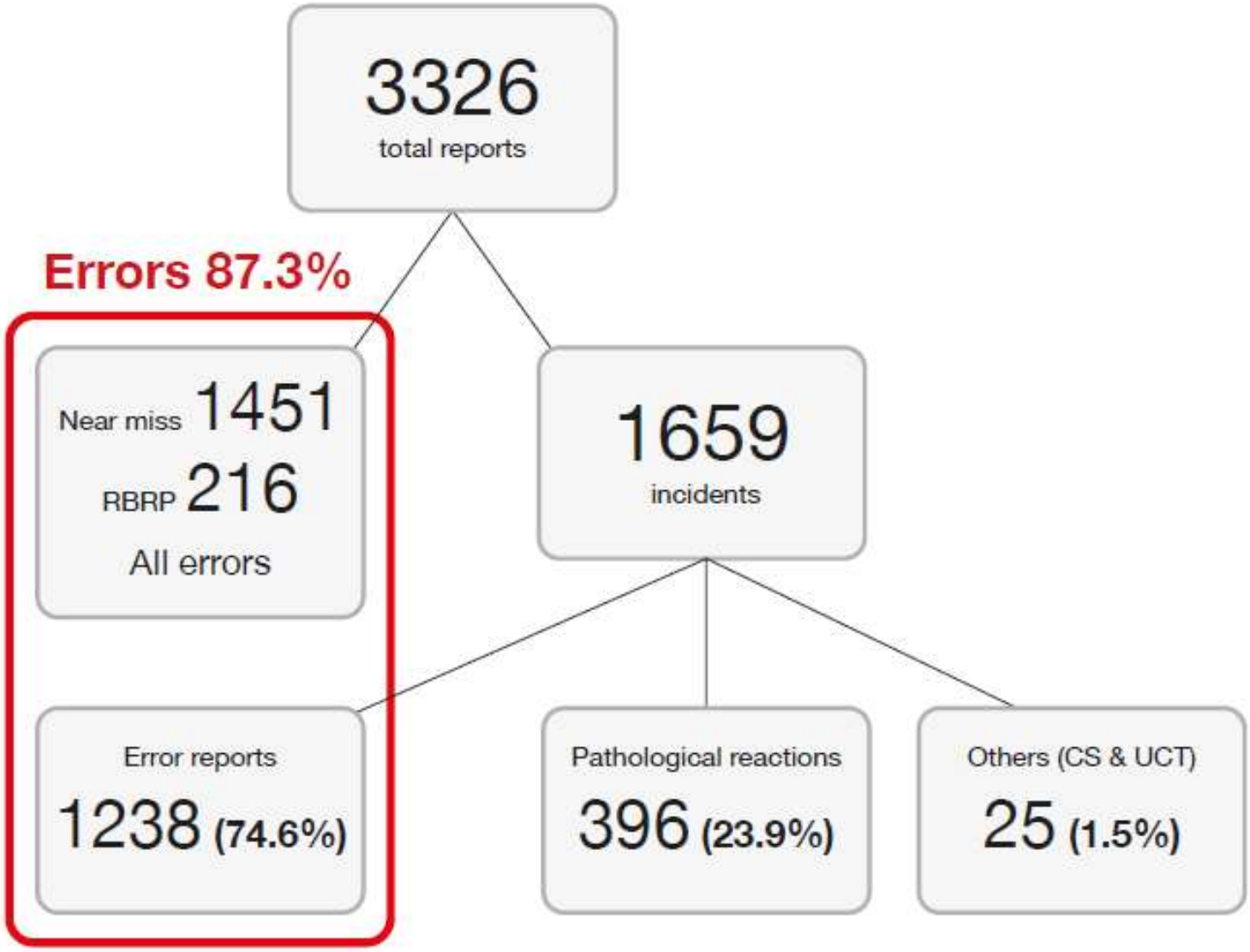
Number of reports submitted to SHOT, and per 10,000 components issued 2010-2018



Percentage of SHOT reports submitted by UK country

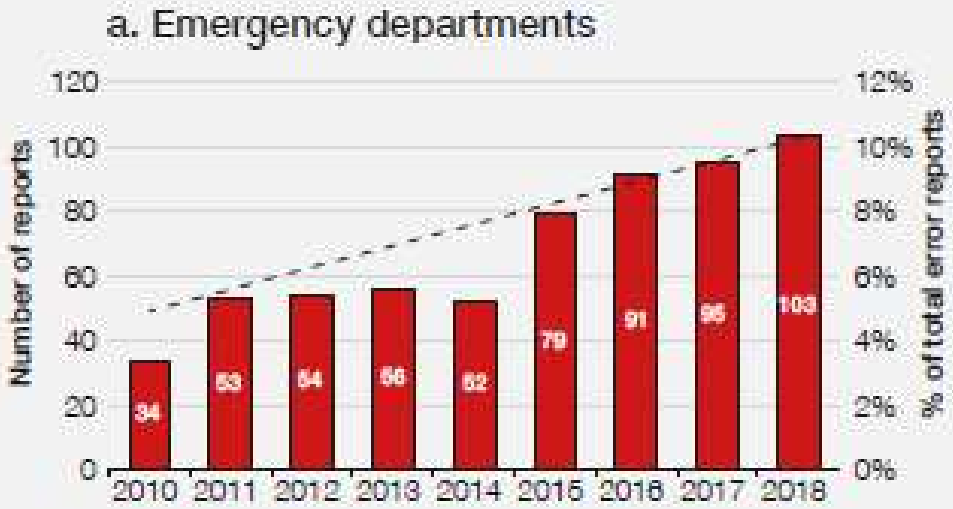


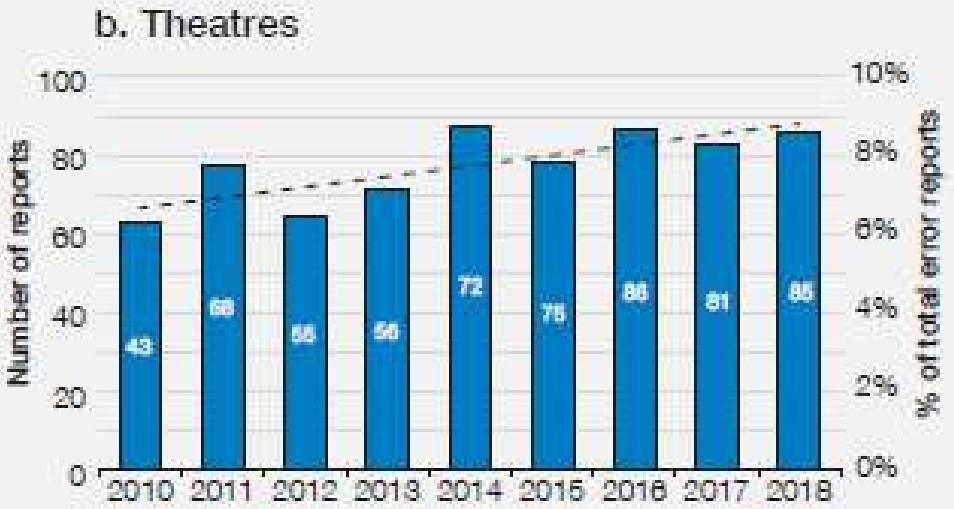
Categorisation of reports analysed in 2018

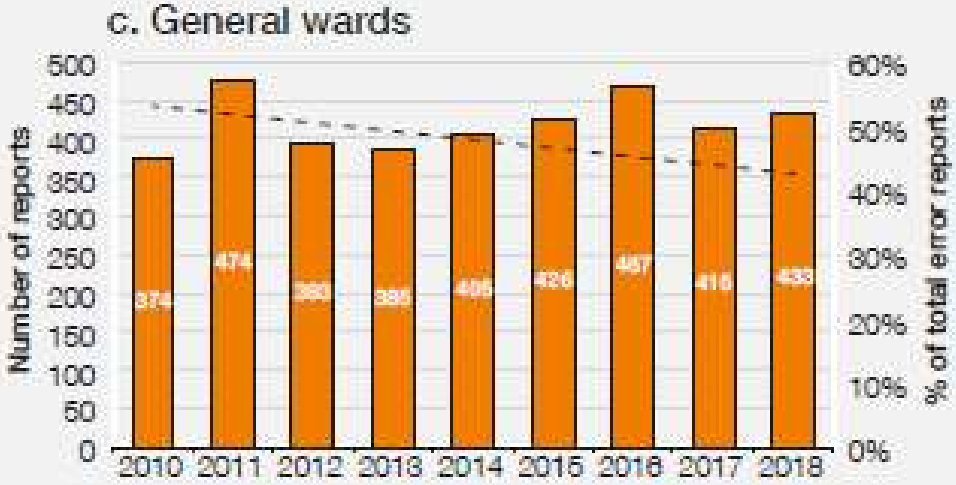


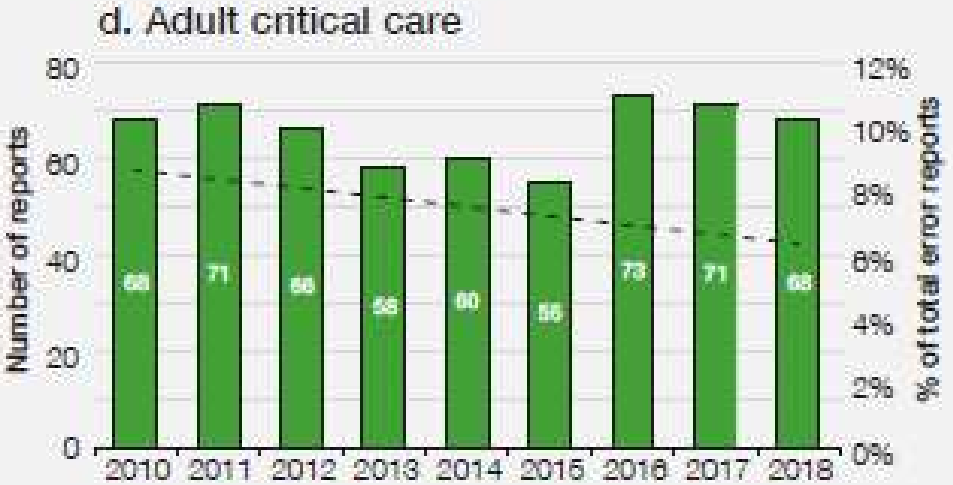
RBRP=right blood right patient; CS=cell salvage; UCT=unclassifiable complications of transfusion

Trend of error reports from different departments

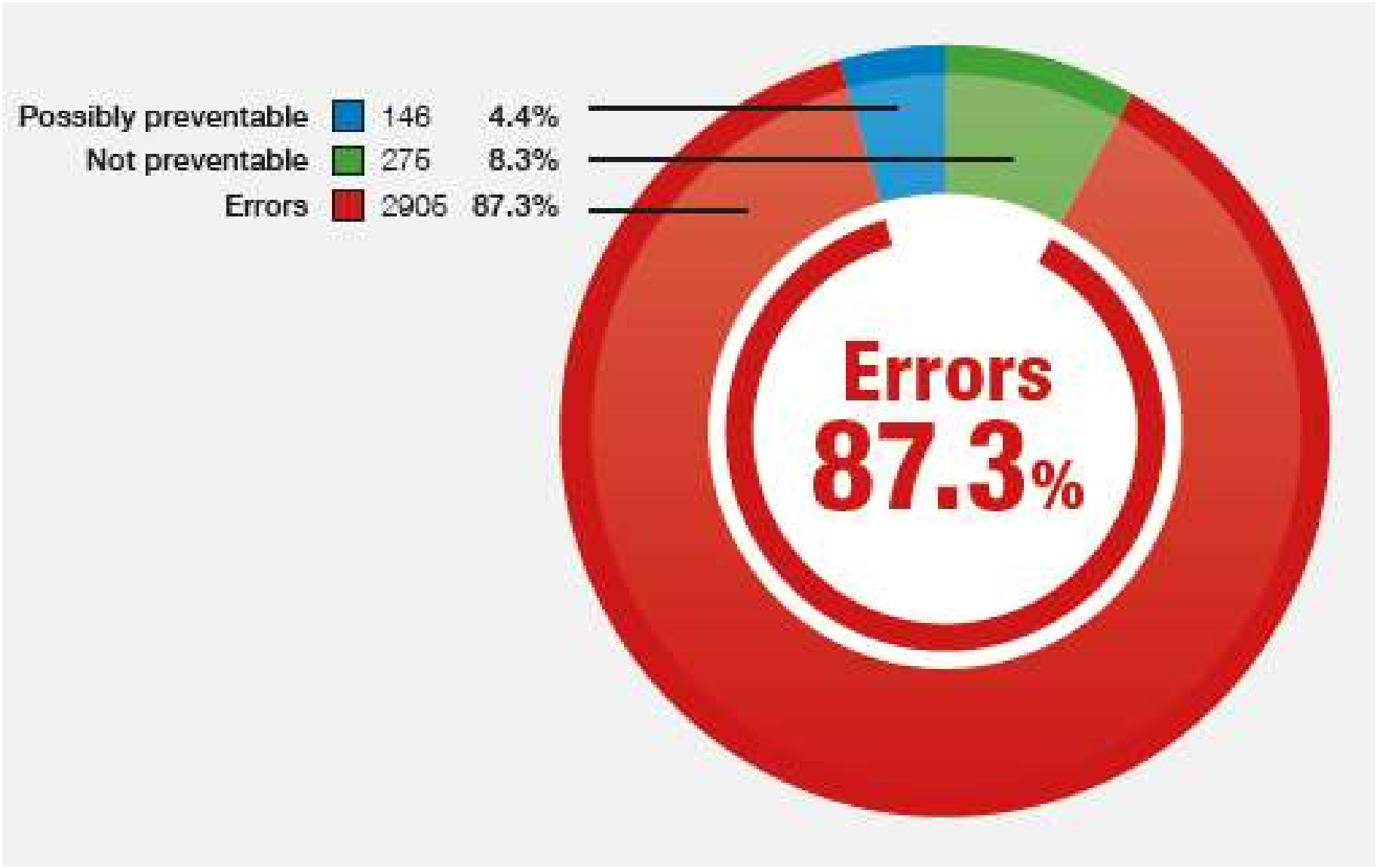




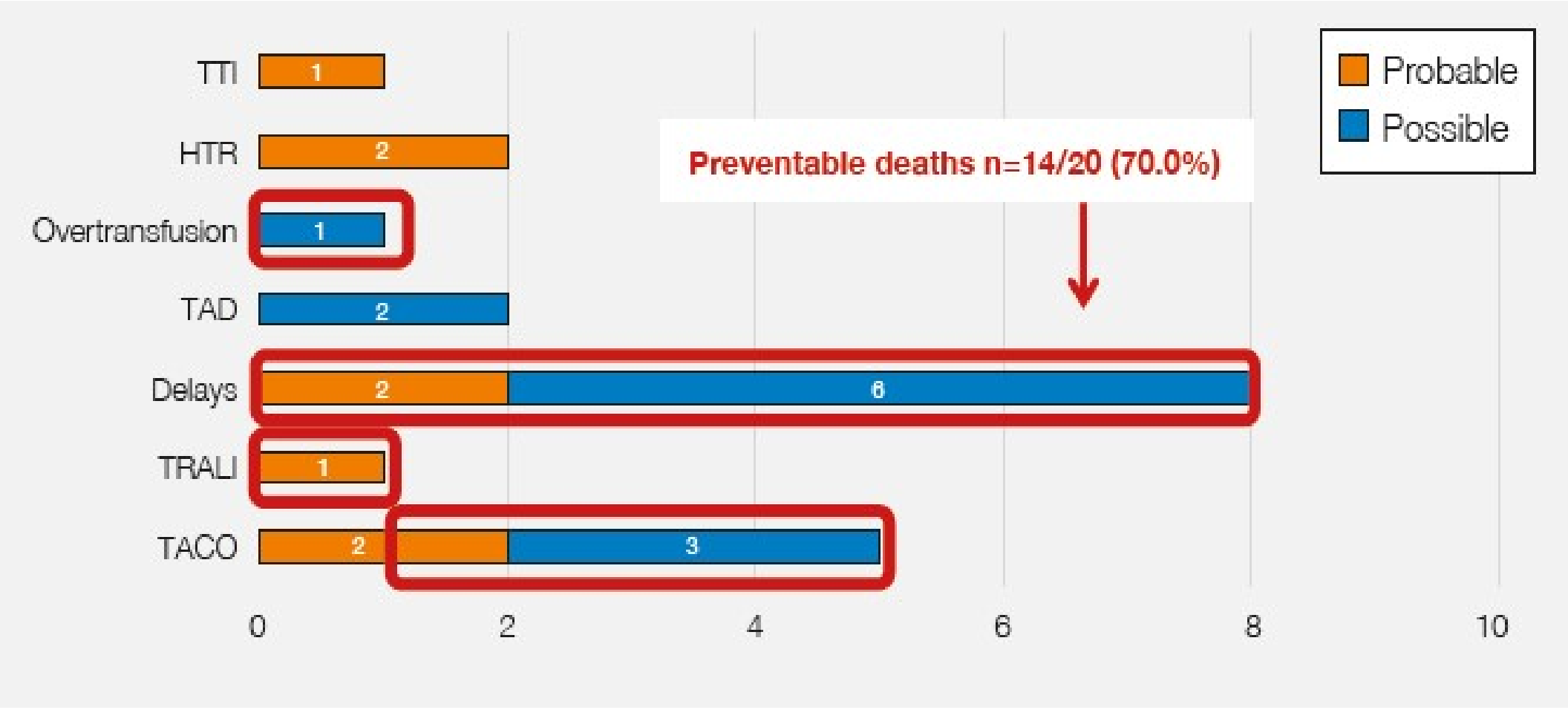




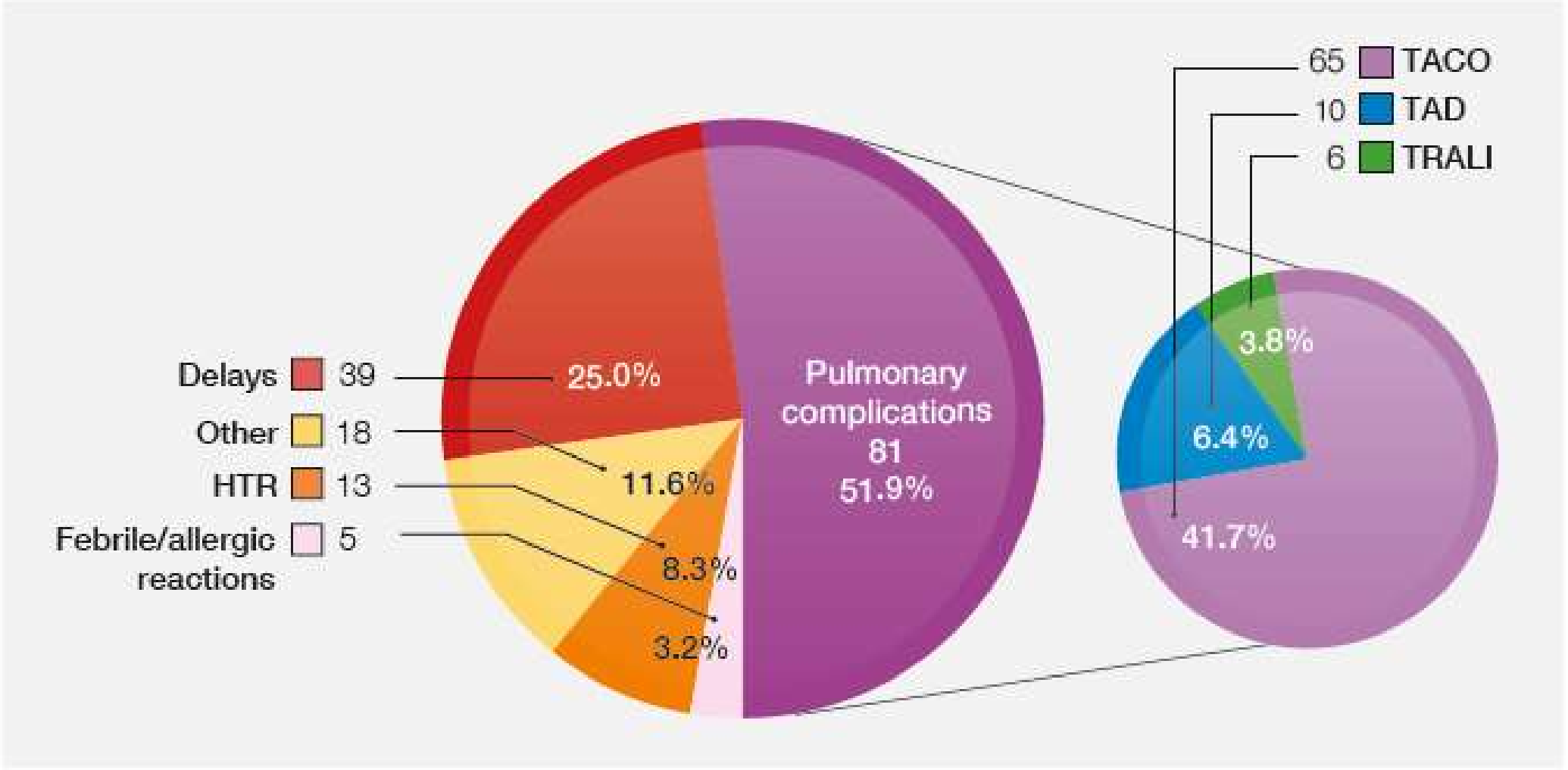
Errors account for the majority of reports in 2018: 2905/3326 (87.3%)



Deaths related to transfusion (with imputability) reported in 2018 n=20

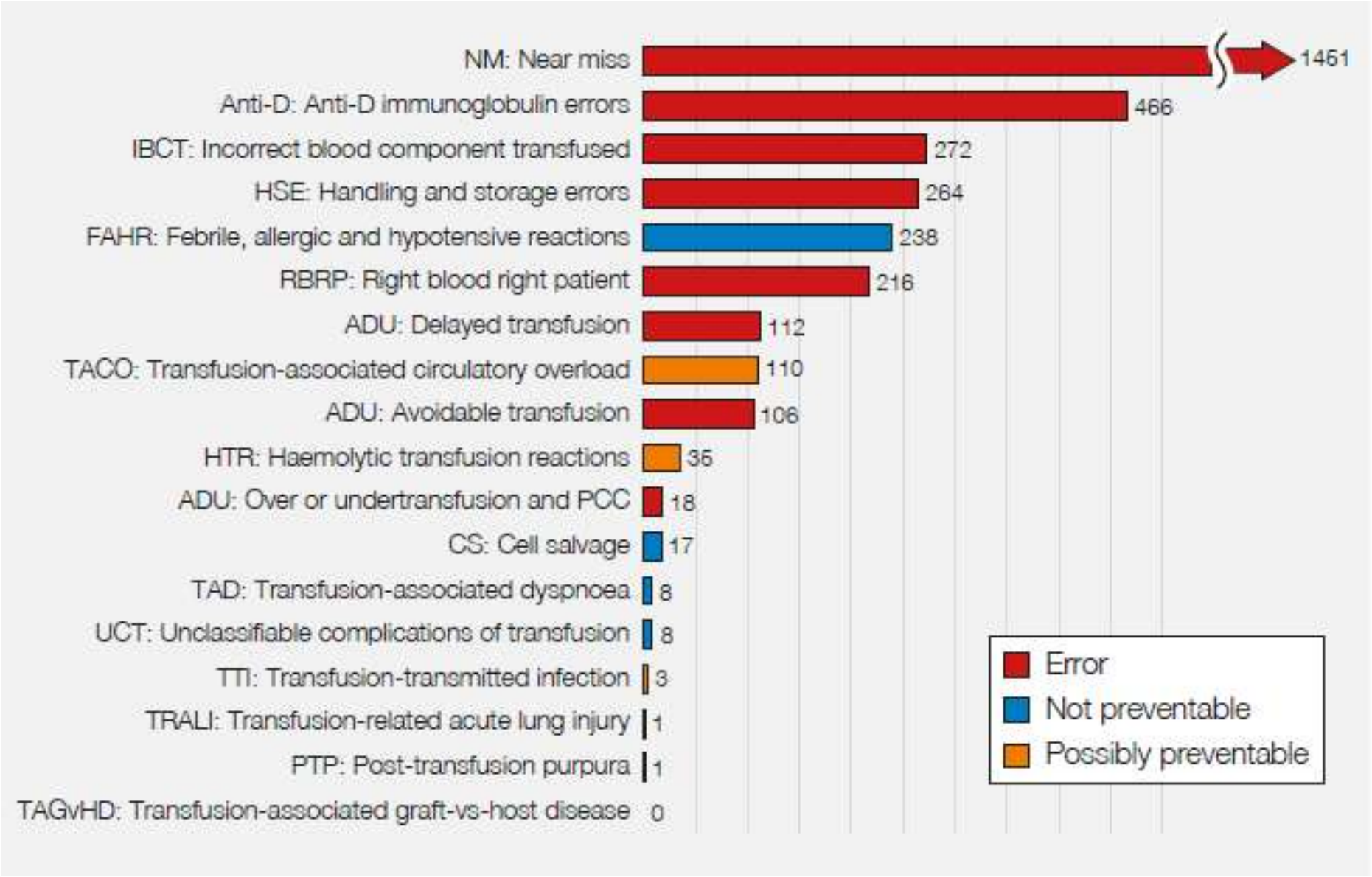


Transfusion-related deaths 2010 to 2018 n=156

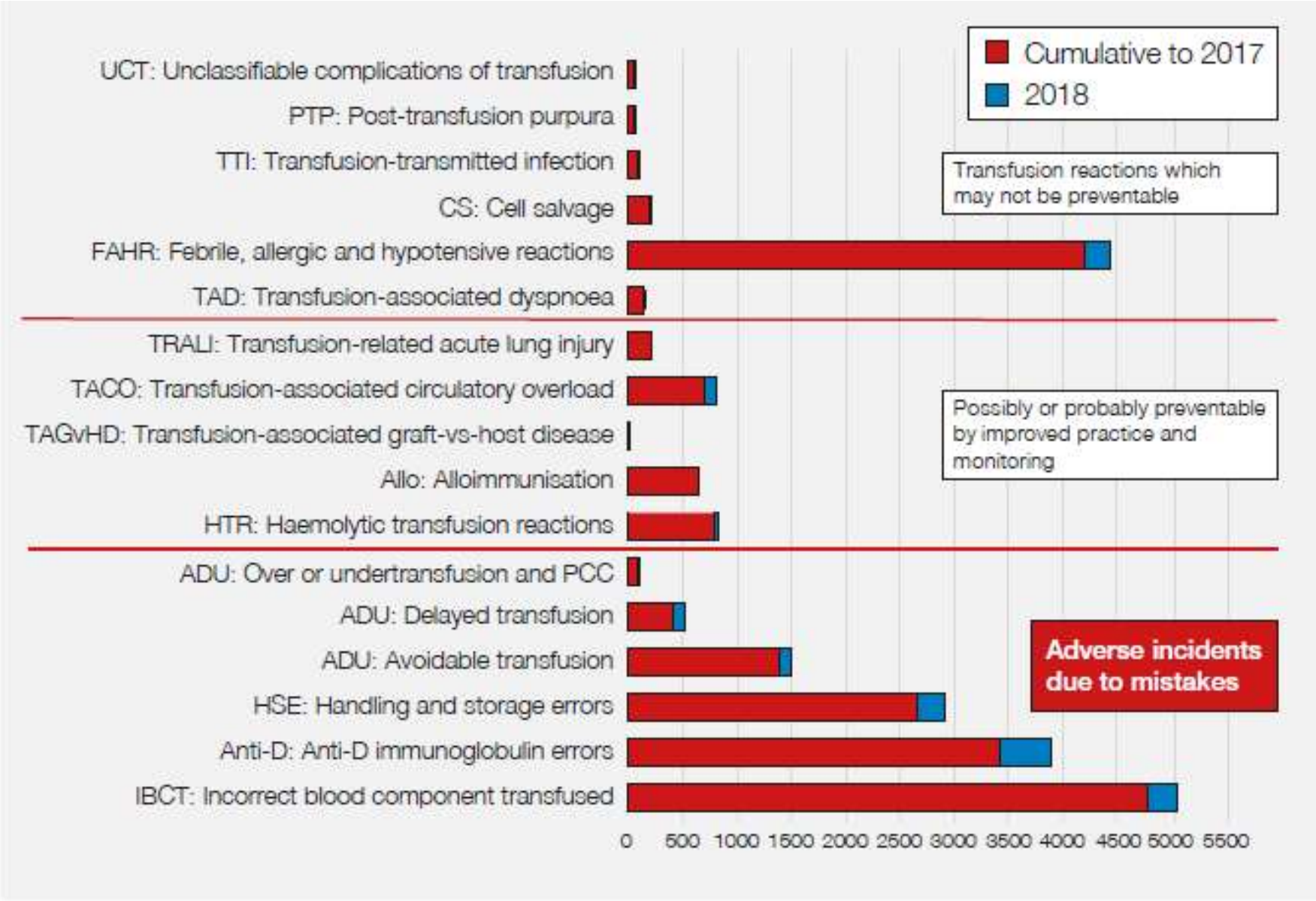


HTR=haemolytic transfusion reaction; TRALI=transfusion-related acute lung injury; TACO=transfusion-associated circulatory overload; TAD=transfusion-associated dyspnoea

Summary data for 2018 all categories n=3326
(ranked by number)

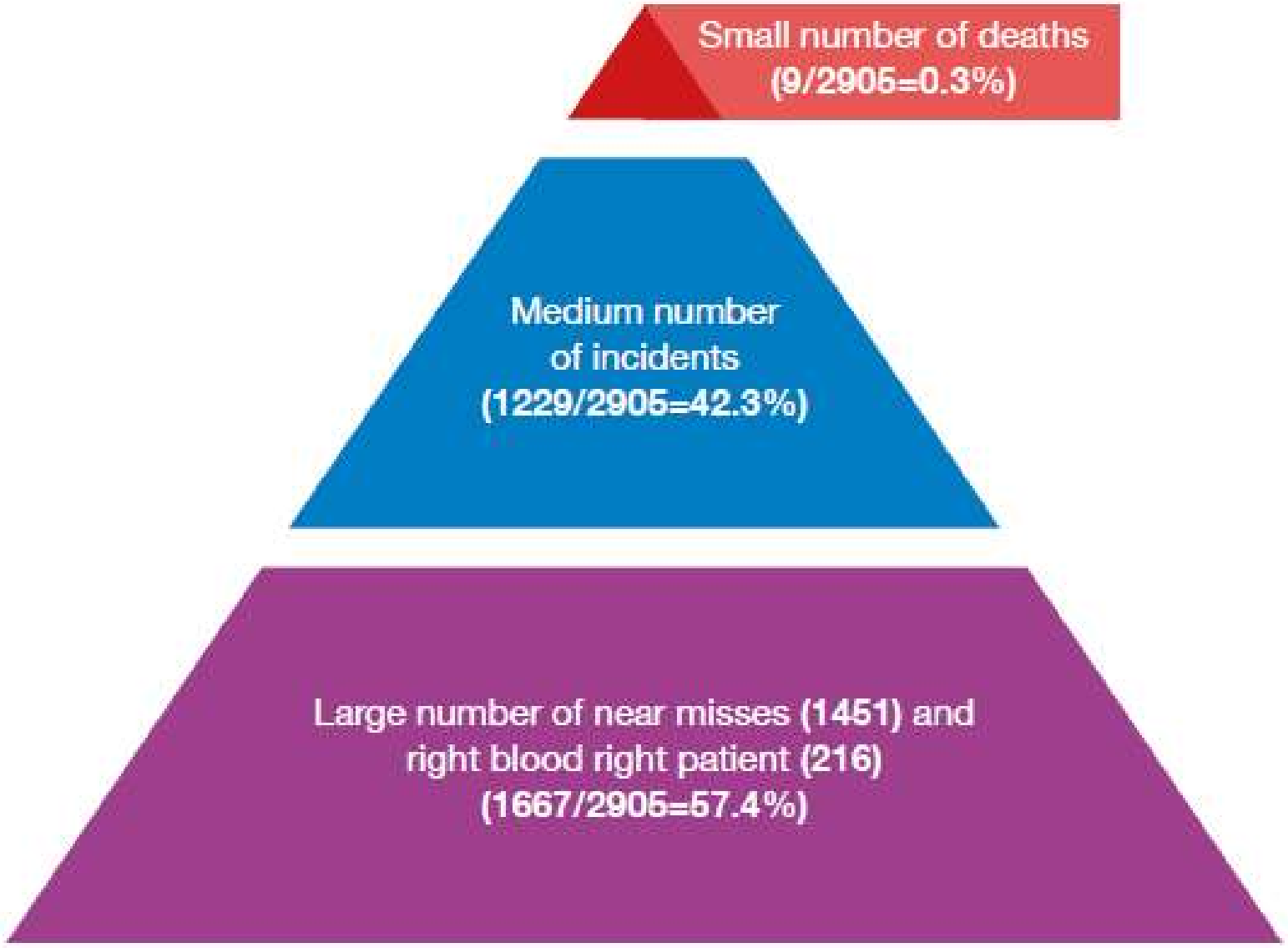


Cumulative data for SHOT categories 1996 to 2018 n=21474

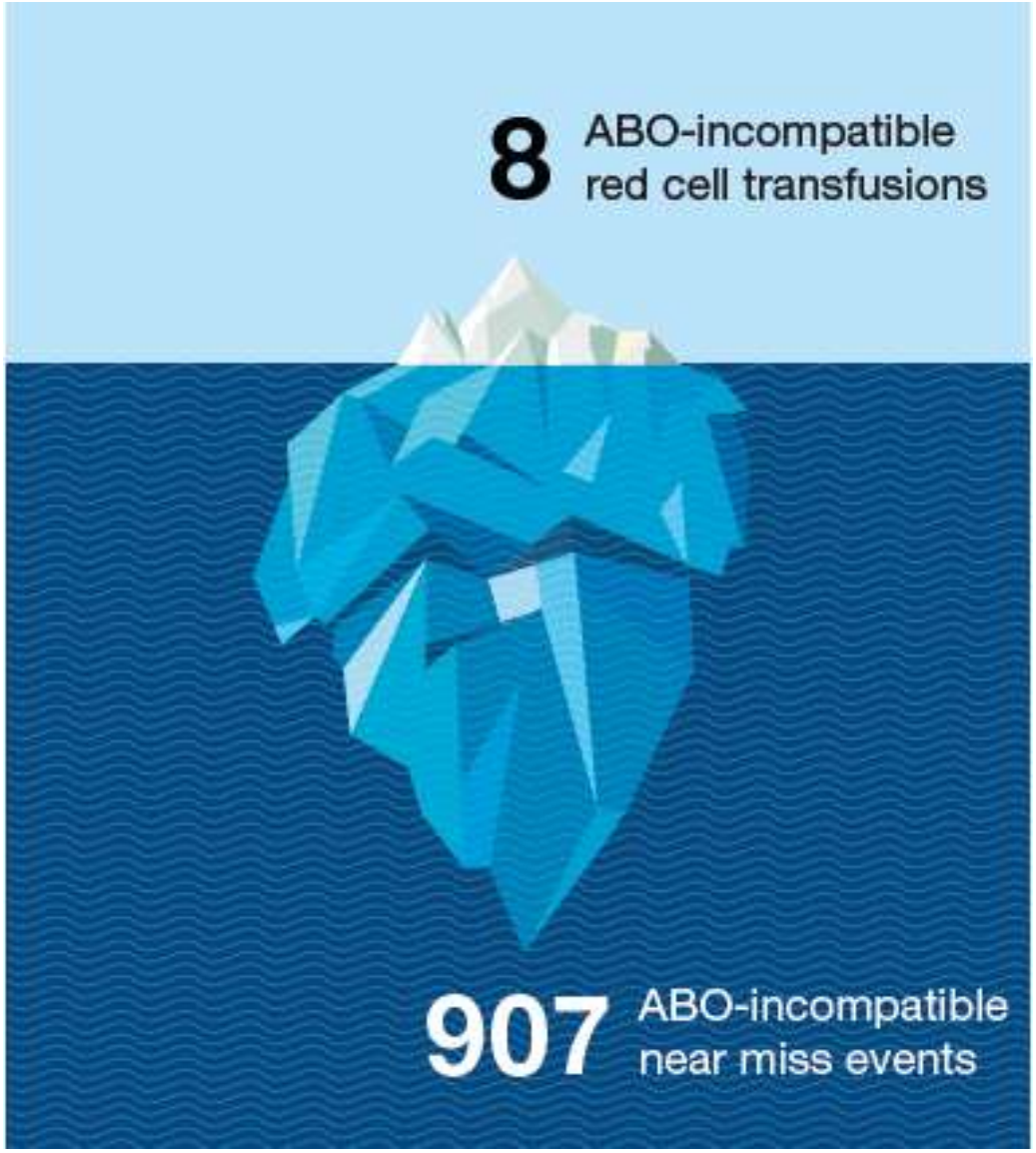


*Data on alloimmunisation have not been collected since 2015

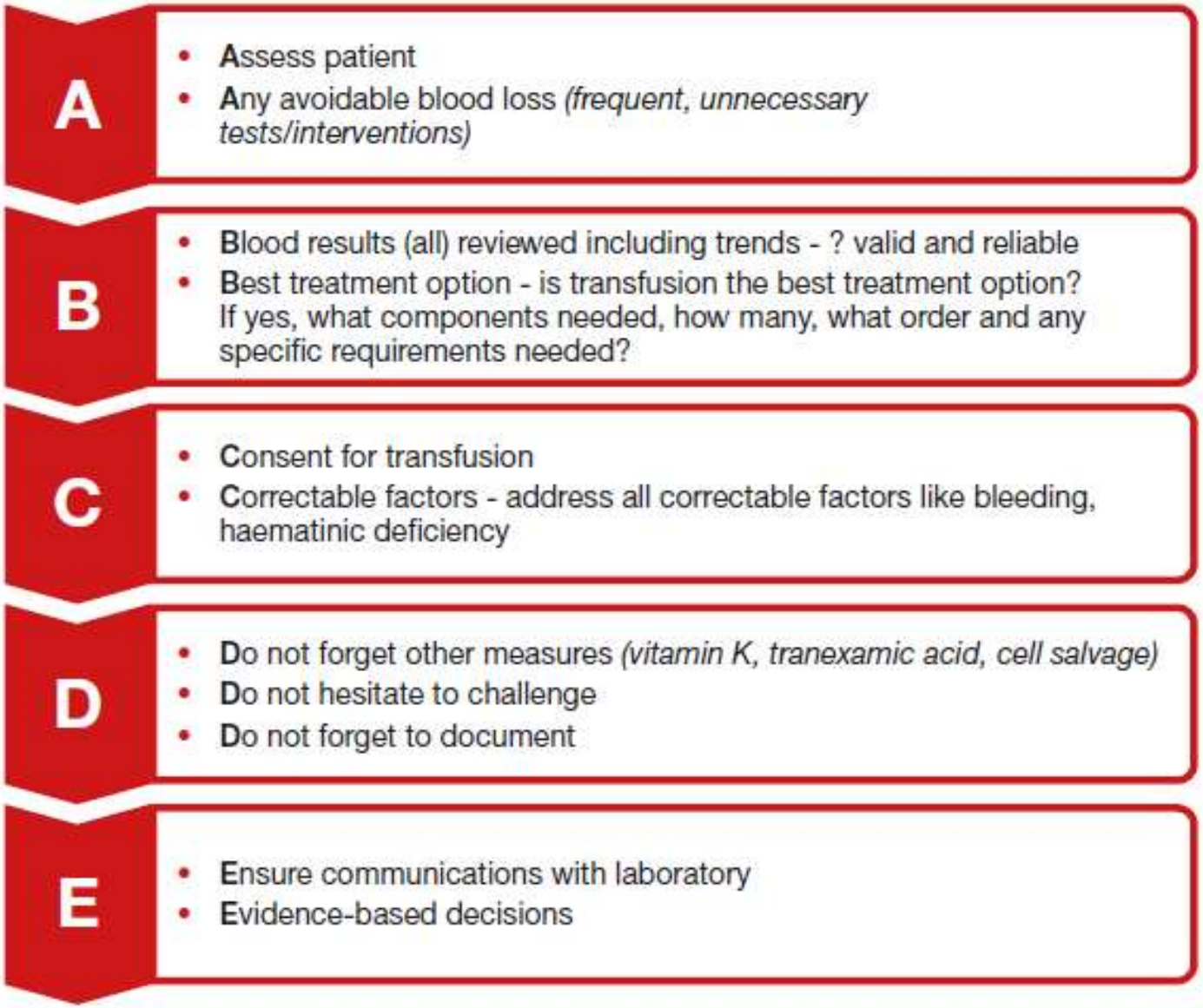
Reported errors triangle



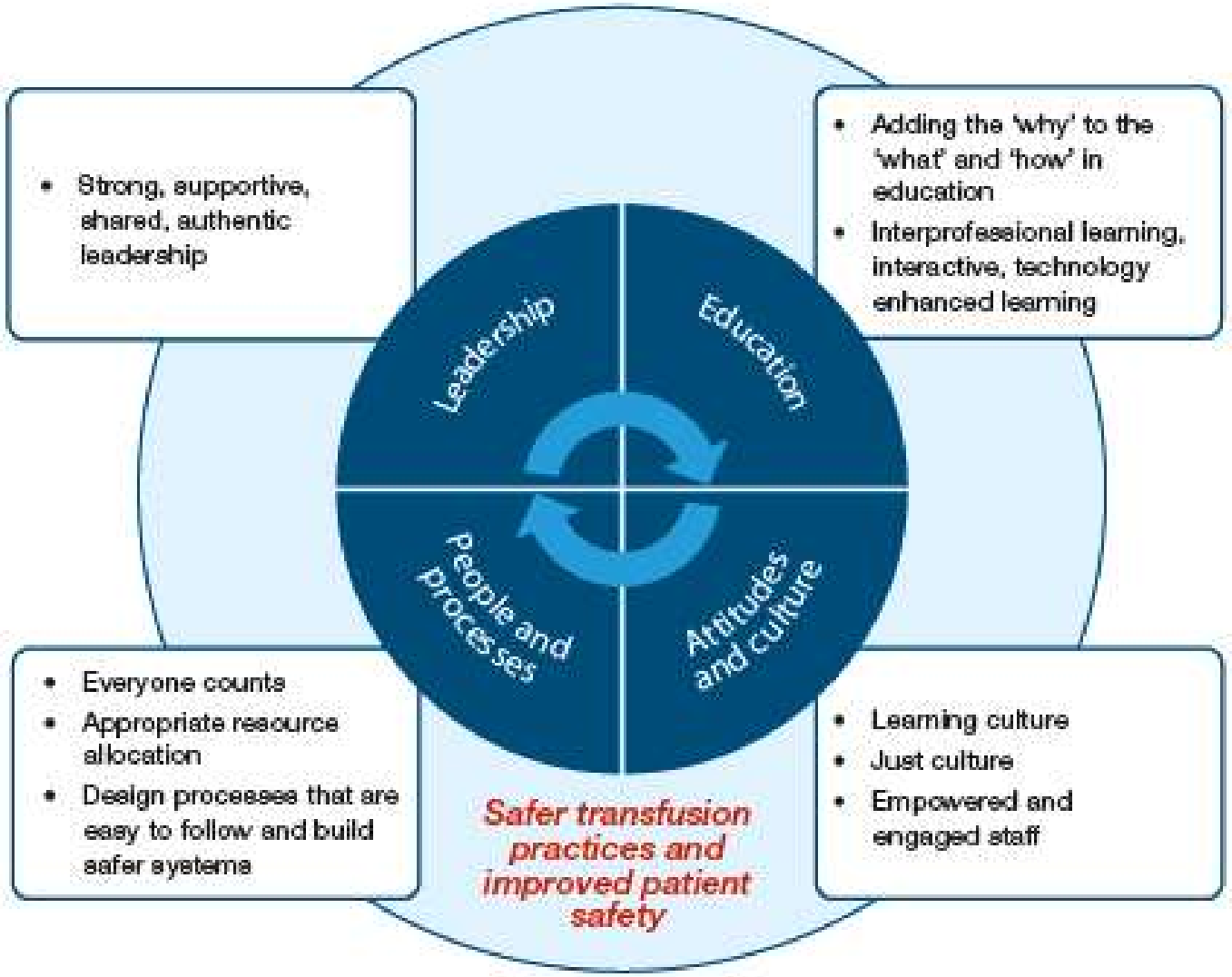
ABO-incompatible red cell transfusions 2016 to 2018



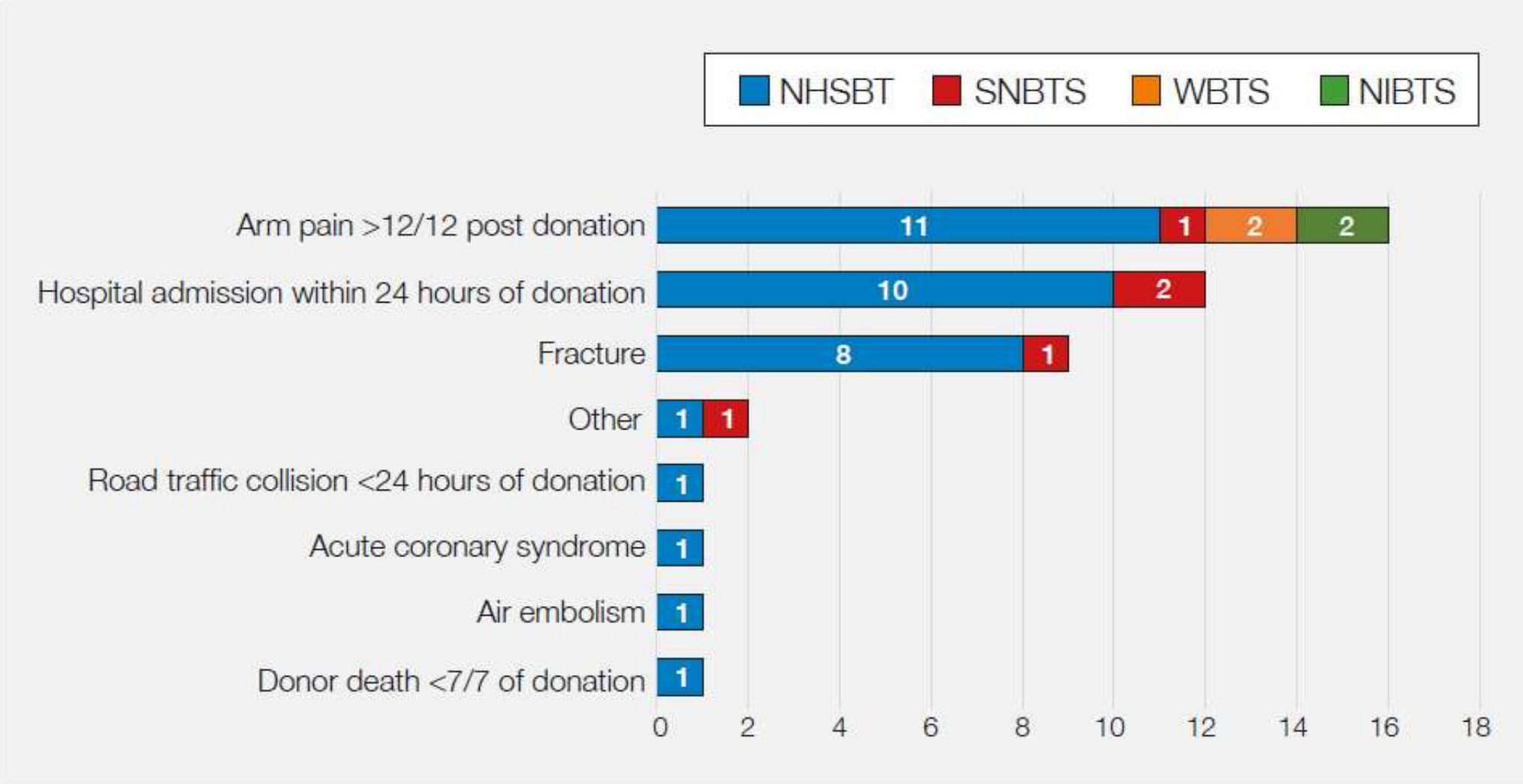
The A-E Decision Tree to facilitate decision making in transfusion



LEAP TO *Transfusion safety*

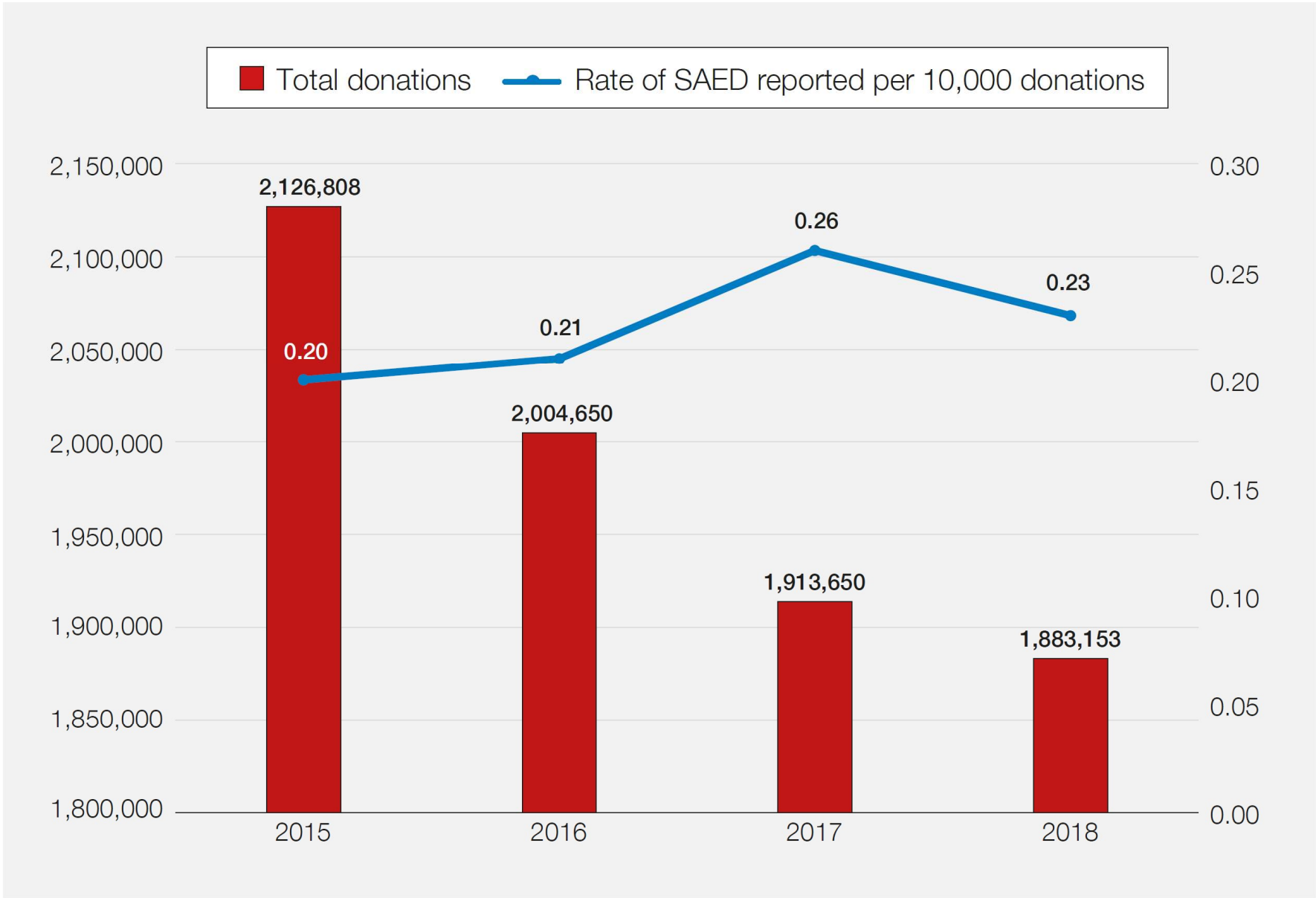


Serious adverse events of donation by category in 2018

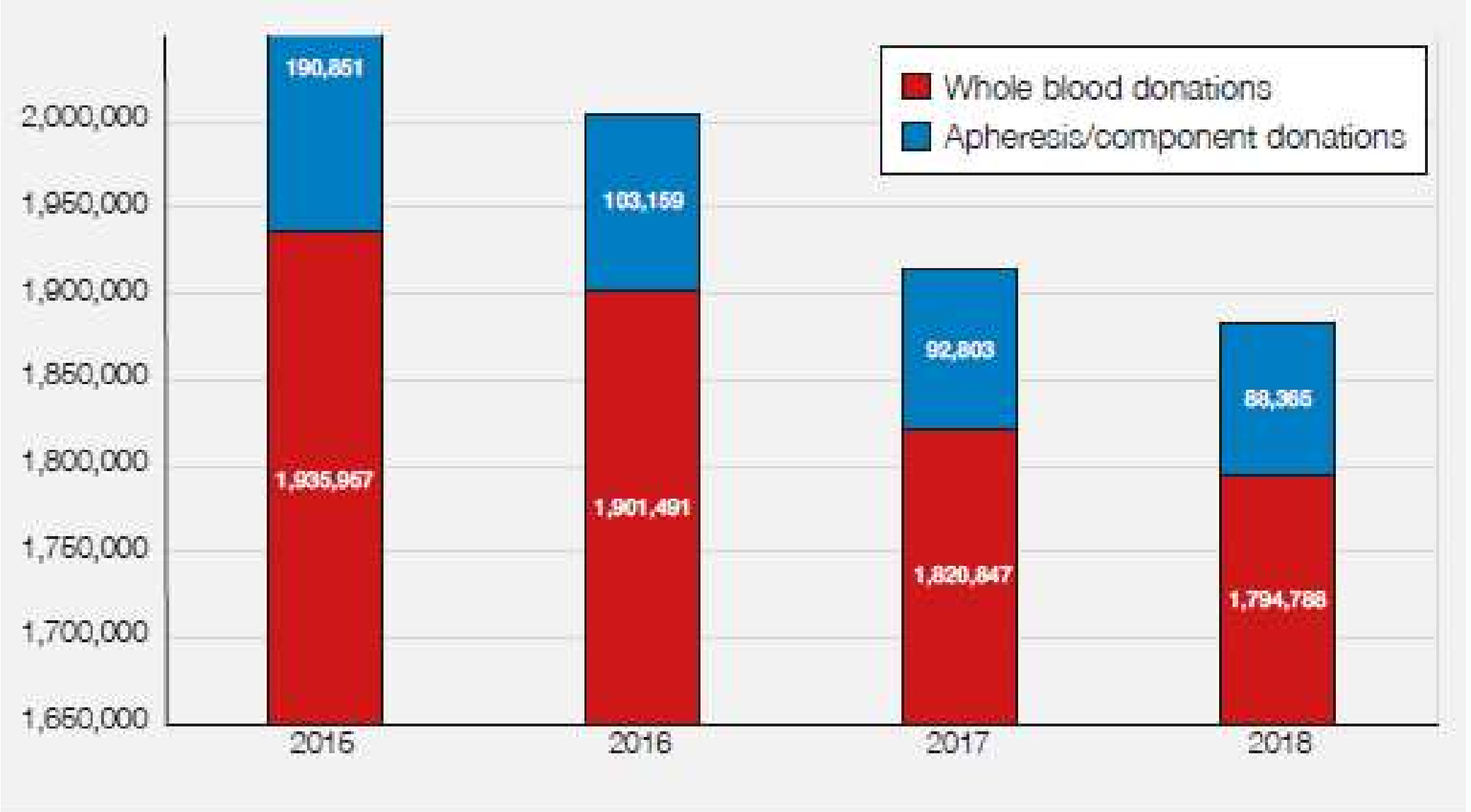


NHSBT=National Health Service Blood and Transplant; SNBTS=Scottish National Blood Transfusion Service; WBS=Welsh Blood Service; NIBTS=Northern Ireland Blood Transfusion Service

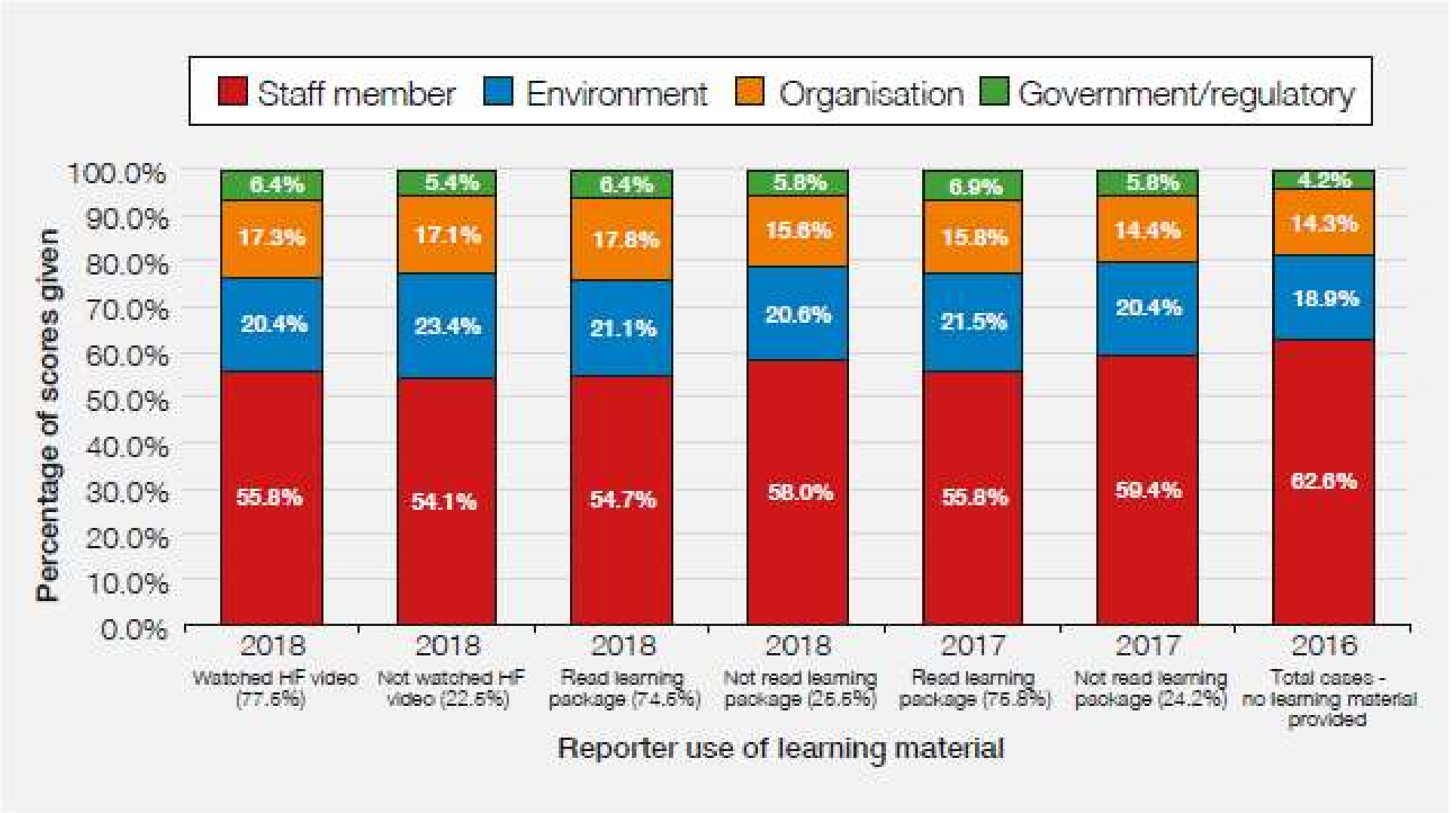
Rate of SAED reported per 10,000 donations in the UK from 2015-2018



Trend in number of donations collected in the UK



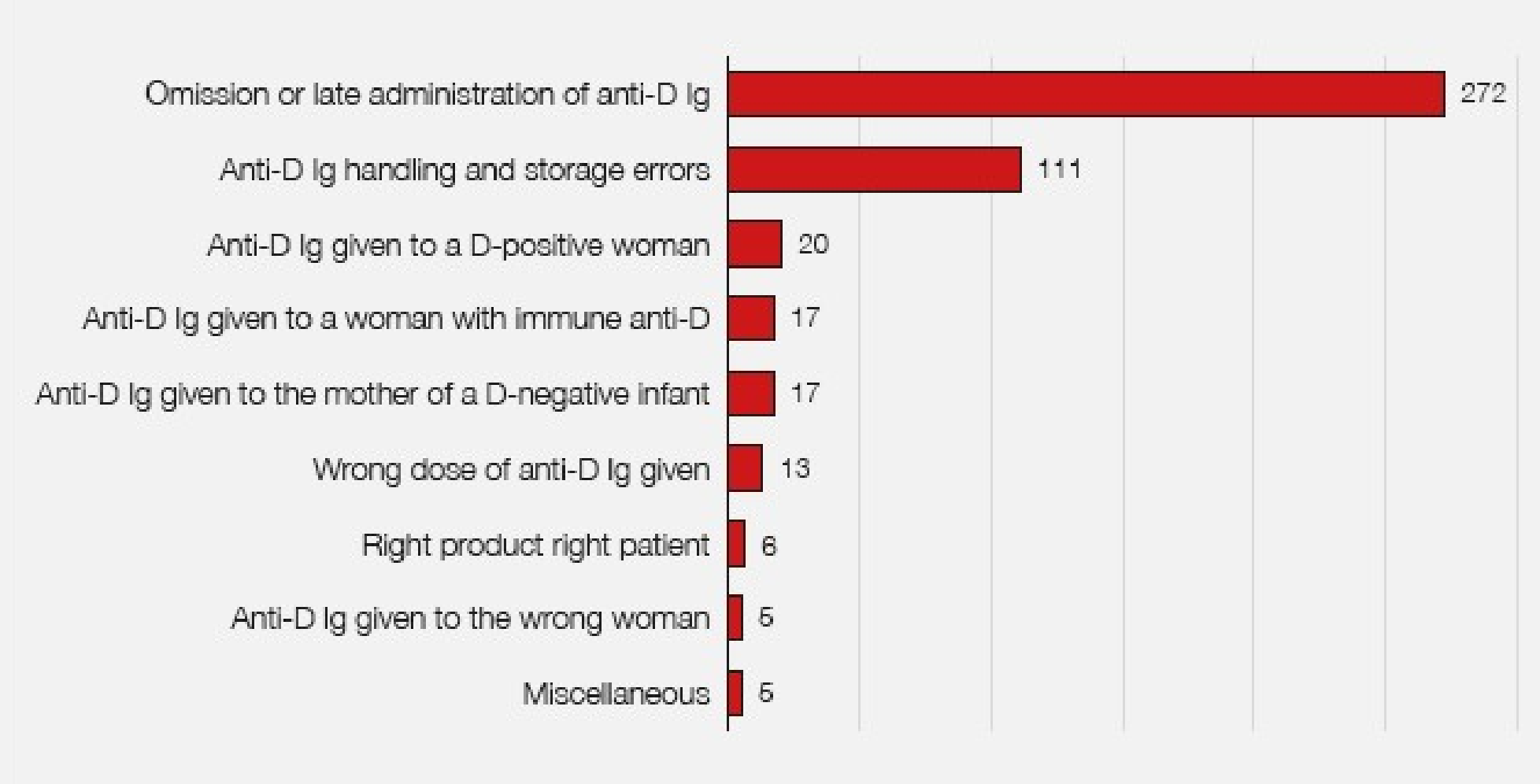
Evaluation of uptake of self-learning opportunity and comparative percentages of scores for human and organisational factors



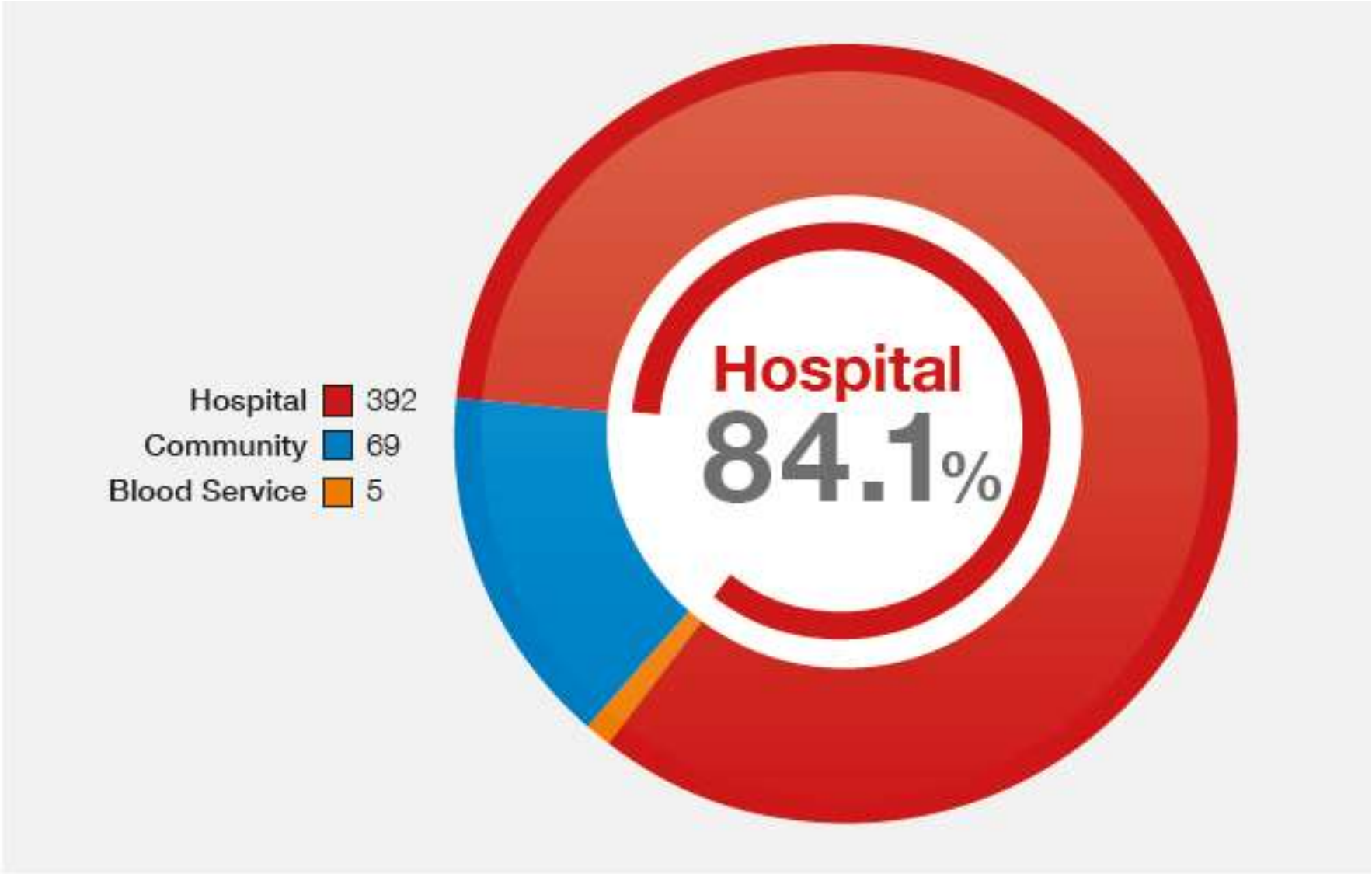
Percentages in column labels=proportion of cases where the reporters used/did not use learning material

HF=human factors

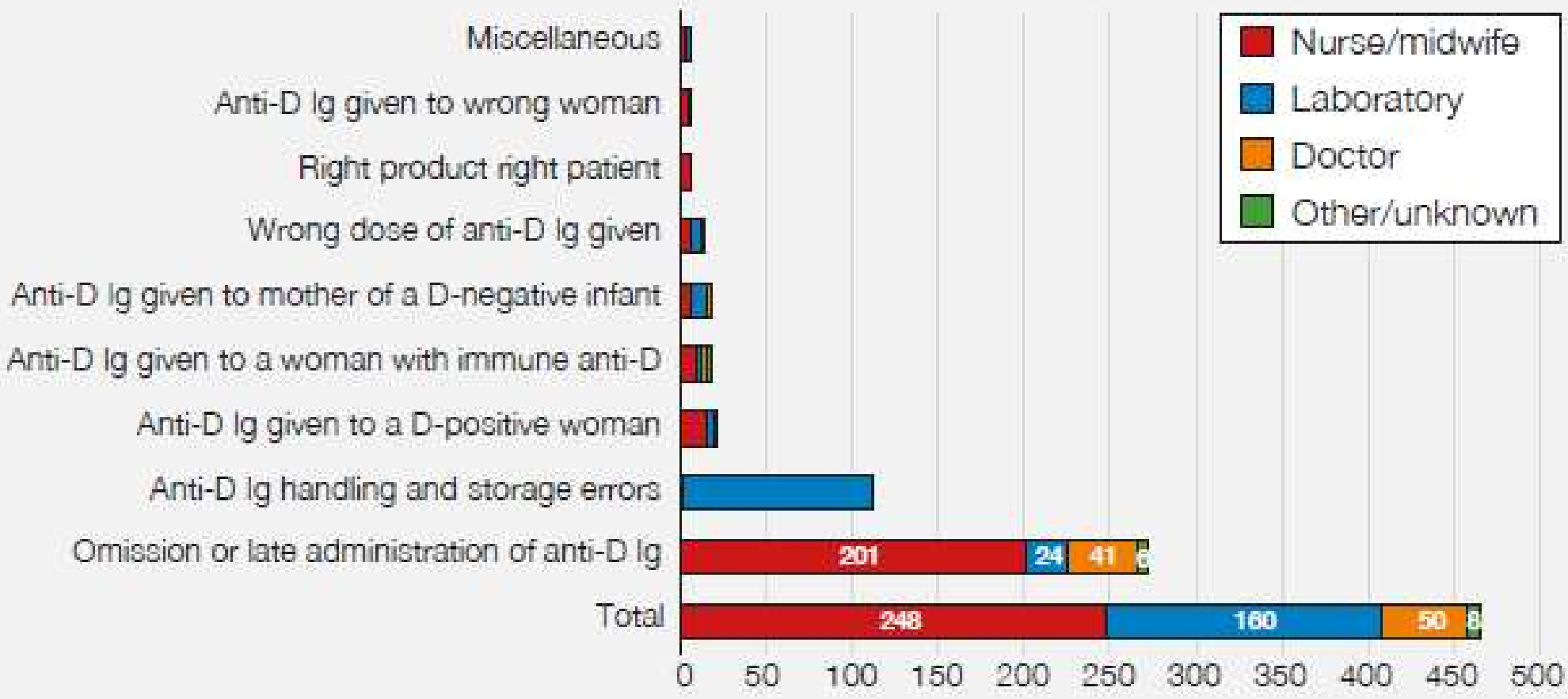
Distribution of anti-D Ig related error reports in 2018 n=466



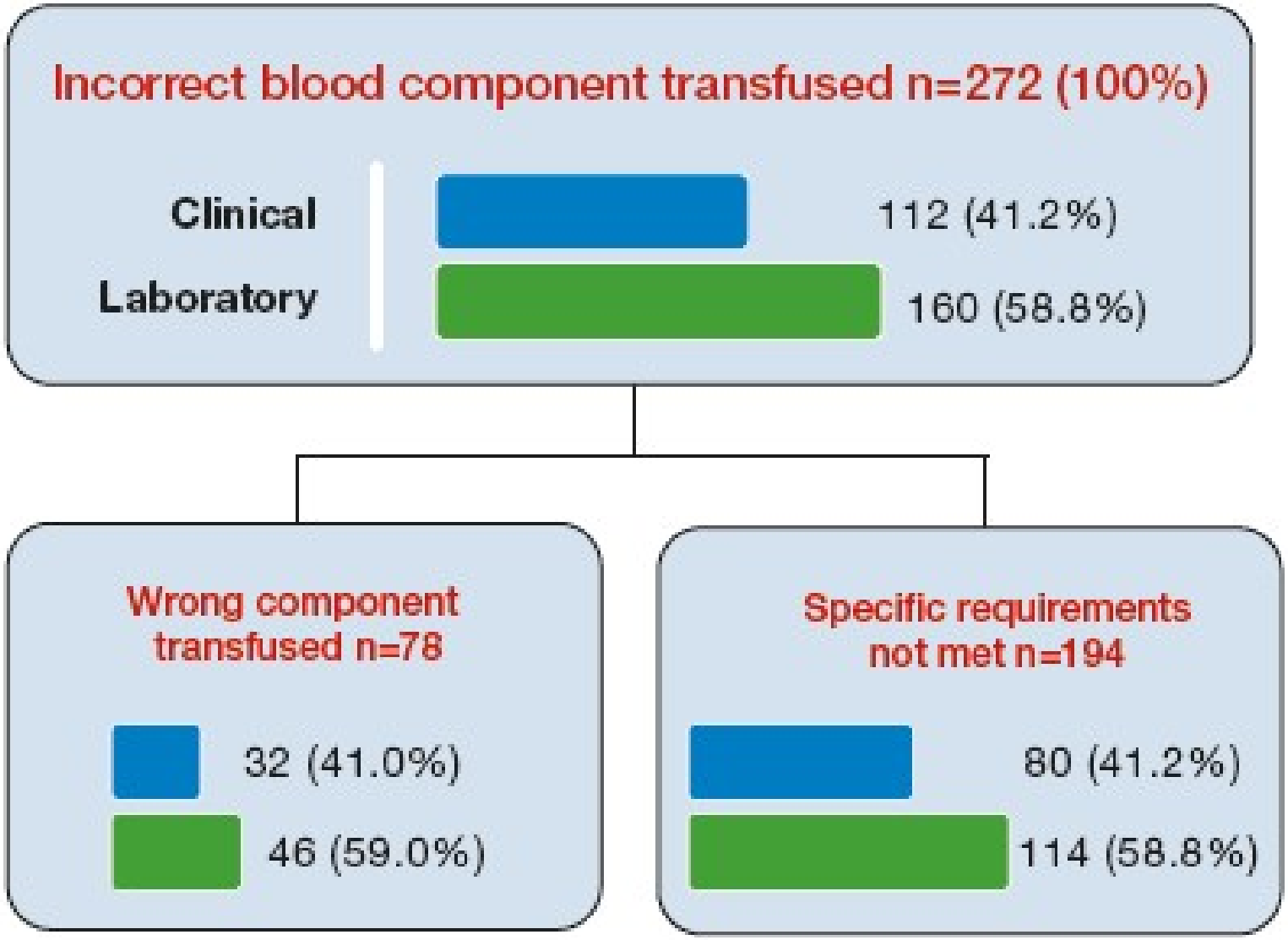
Location of errors associated with anti-D Ig



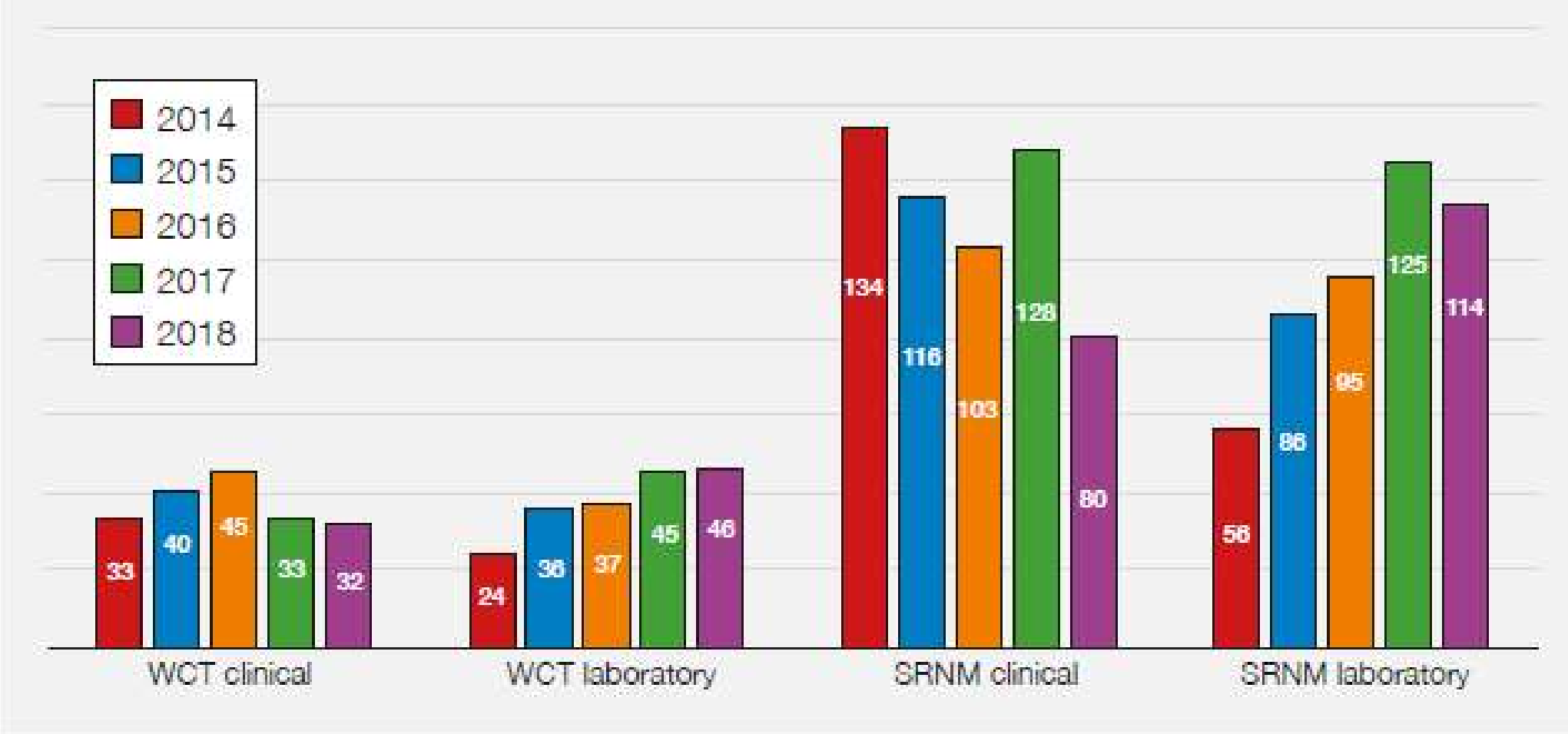
Staff group responsible for the primary error associated with anti-D Ig by category



Overview of reports where an incorrect blood component was transfused in 2018 n=272

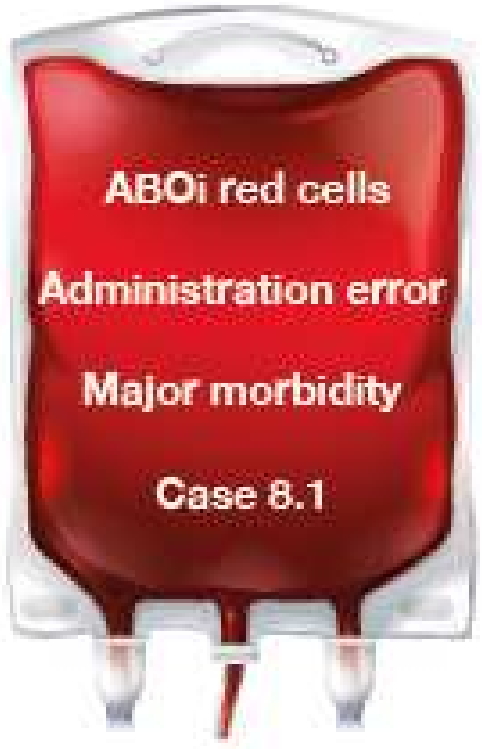


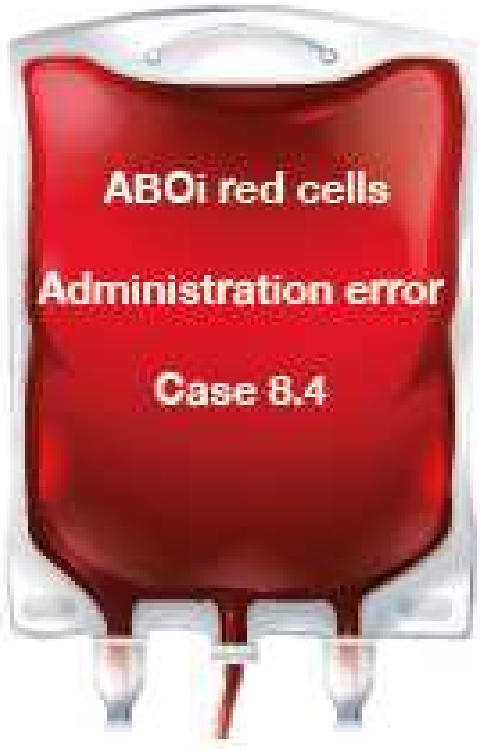
Review of IBCT reports over a 5-year period

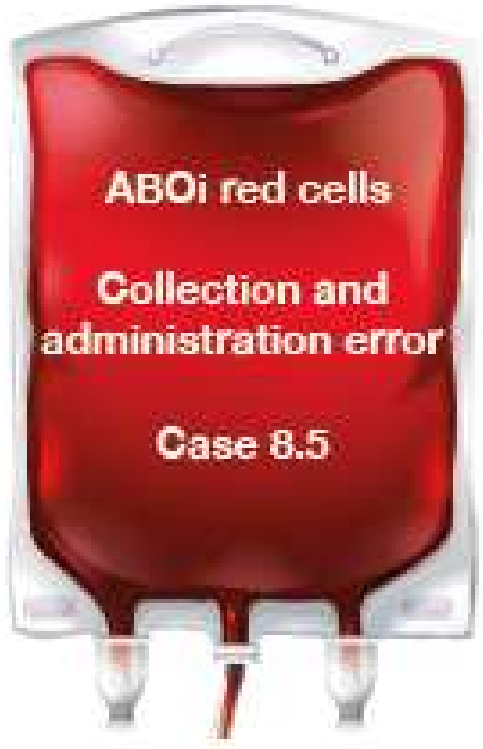


WCT=wrong component transfused; SRNM=specific requirements not met

Clinical ABO-incompatible red cell transfusions n=3





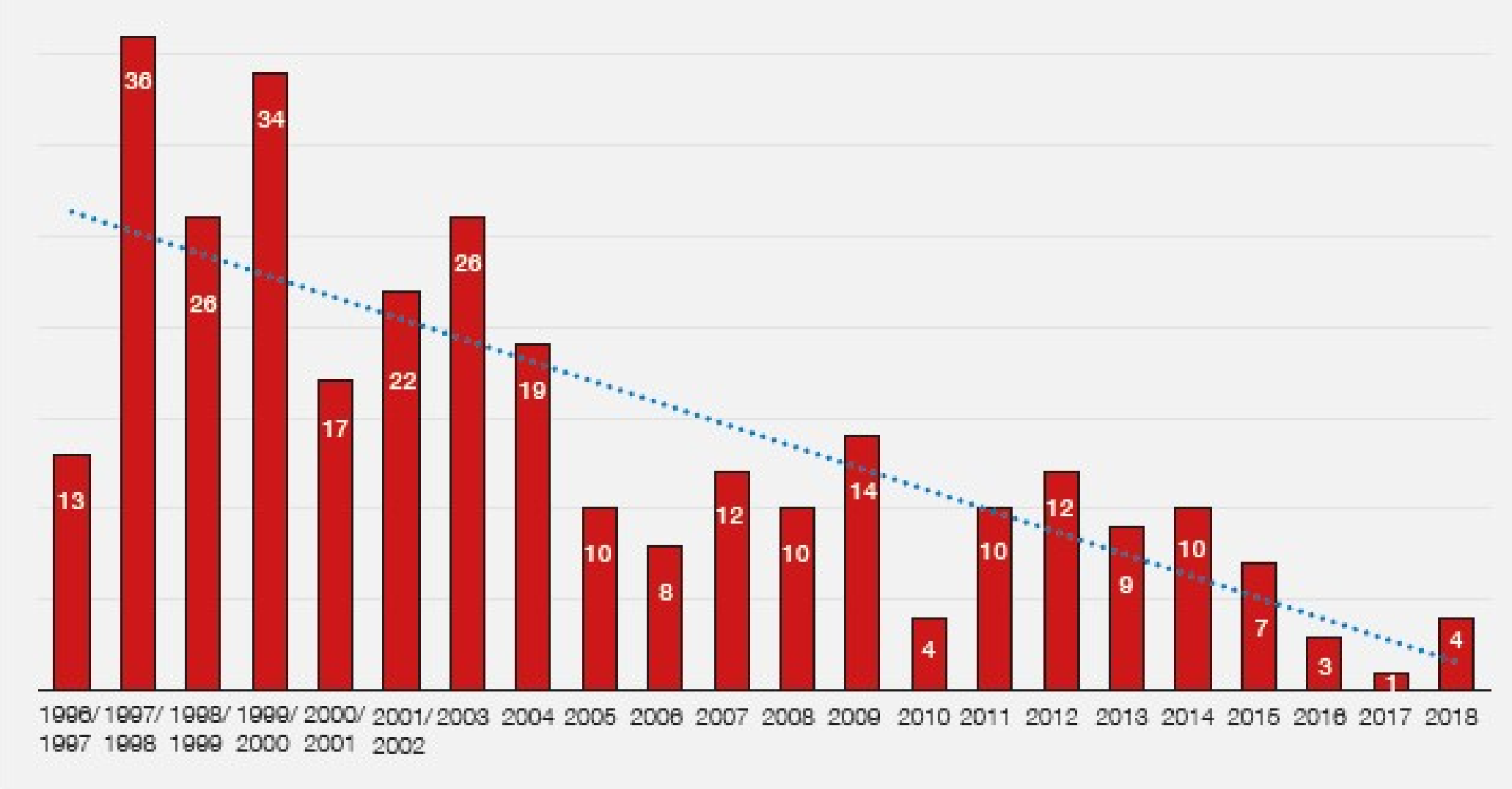


ABOi=ABO-incompatible

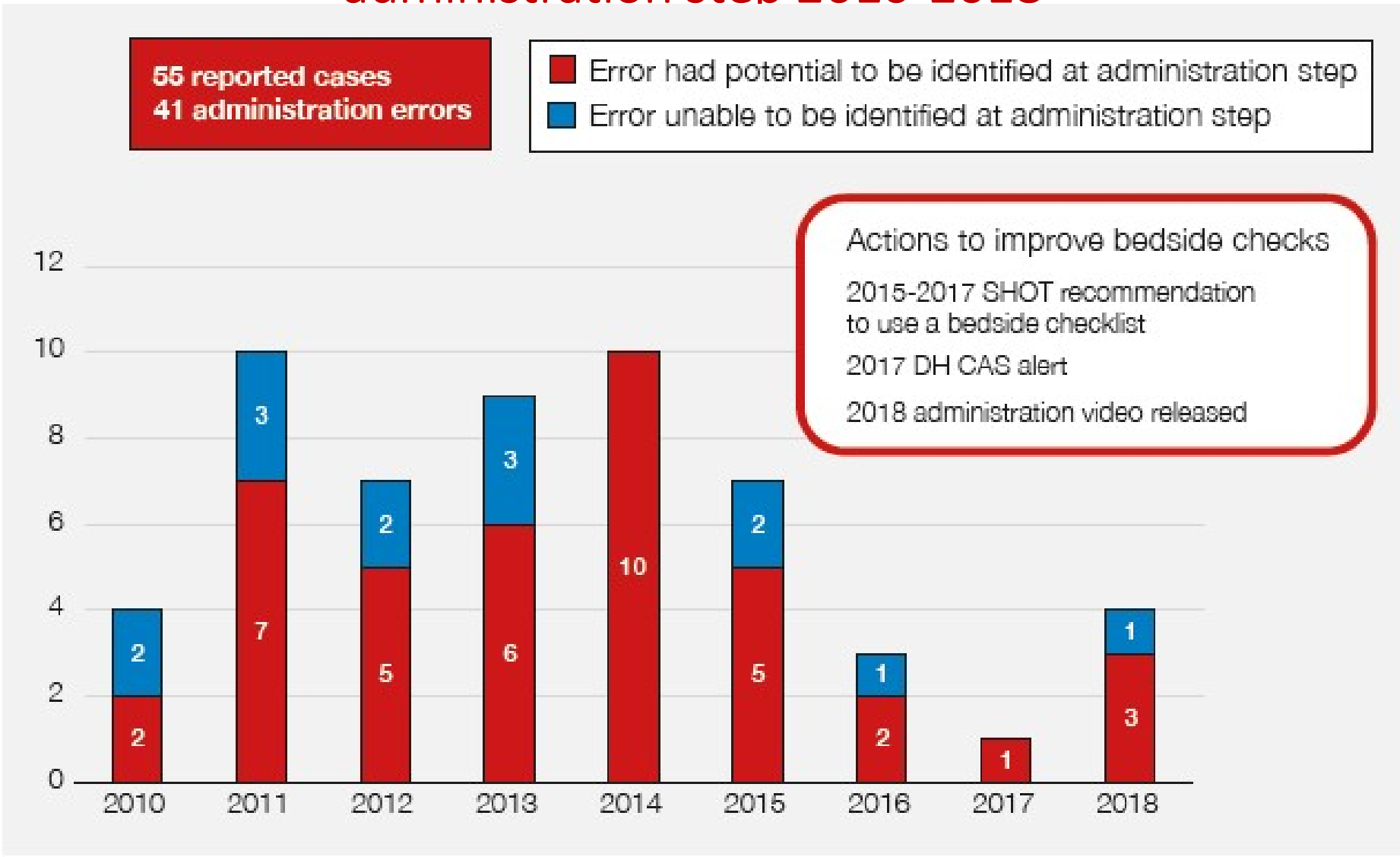
Laboratory ABO-incompatible transfusions n=4

ABOi=ABO-incompatible; FFP=fresh frozen plasma

Number of ABO-incompatible red cell transfusions 1996-2018

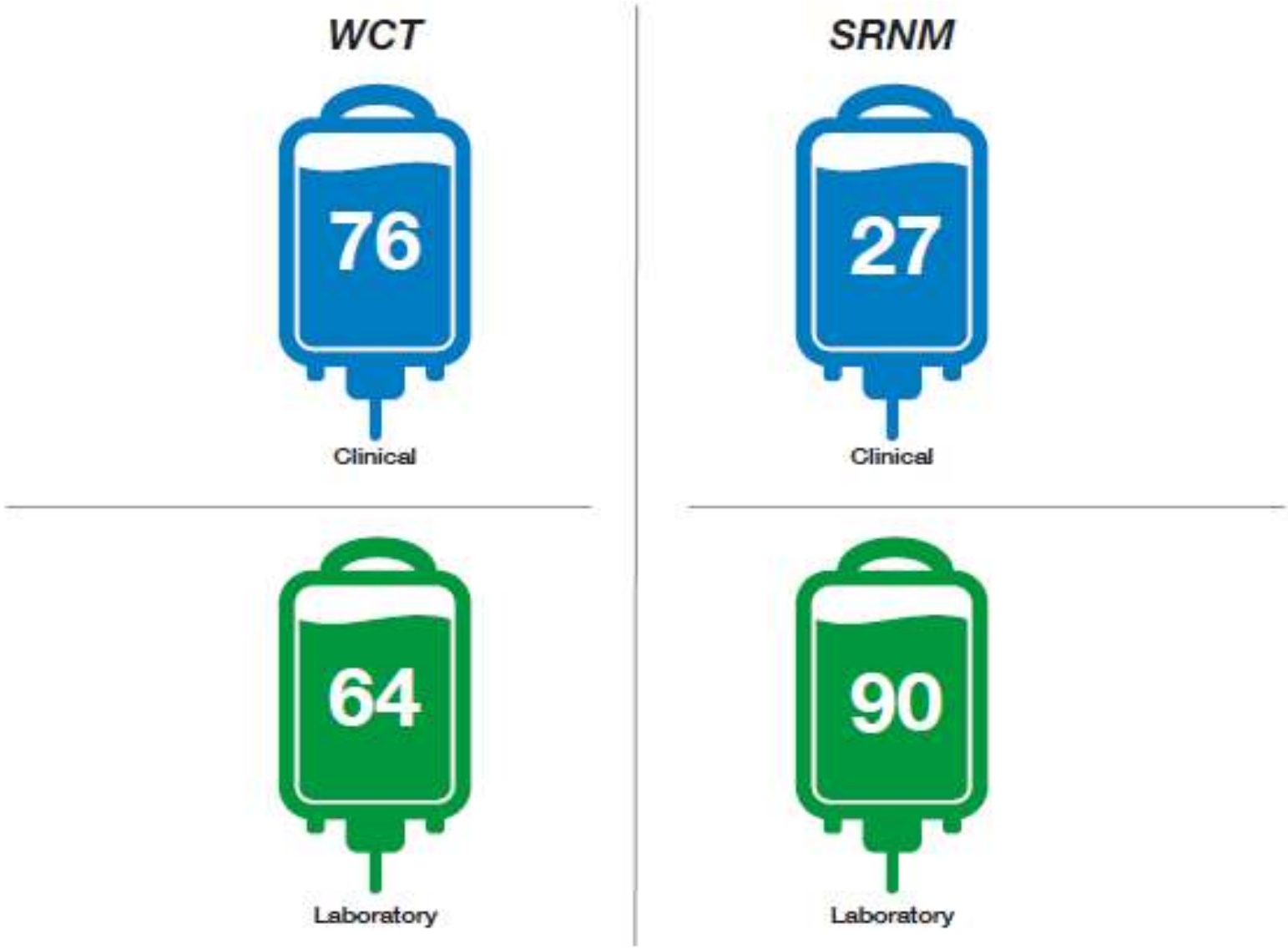


Number of ABO-incompatible red cell transfusions where the first error occurred or had the potential to be identified at the administration step 2010-2018



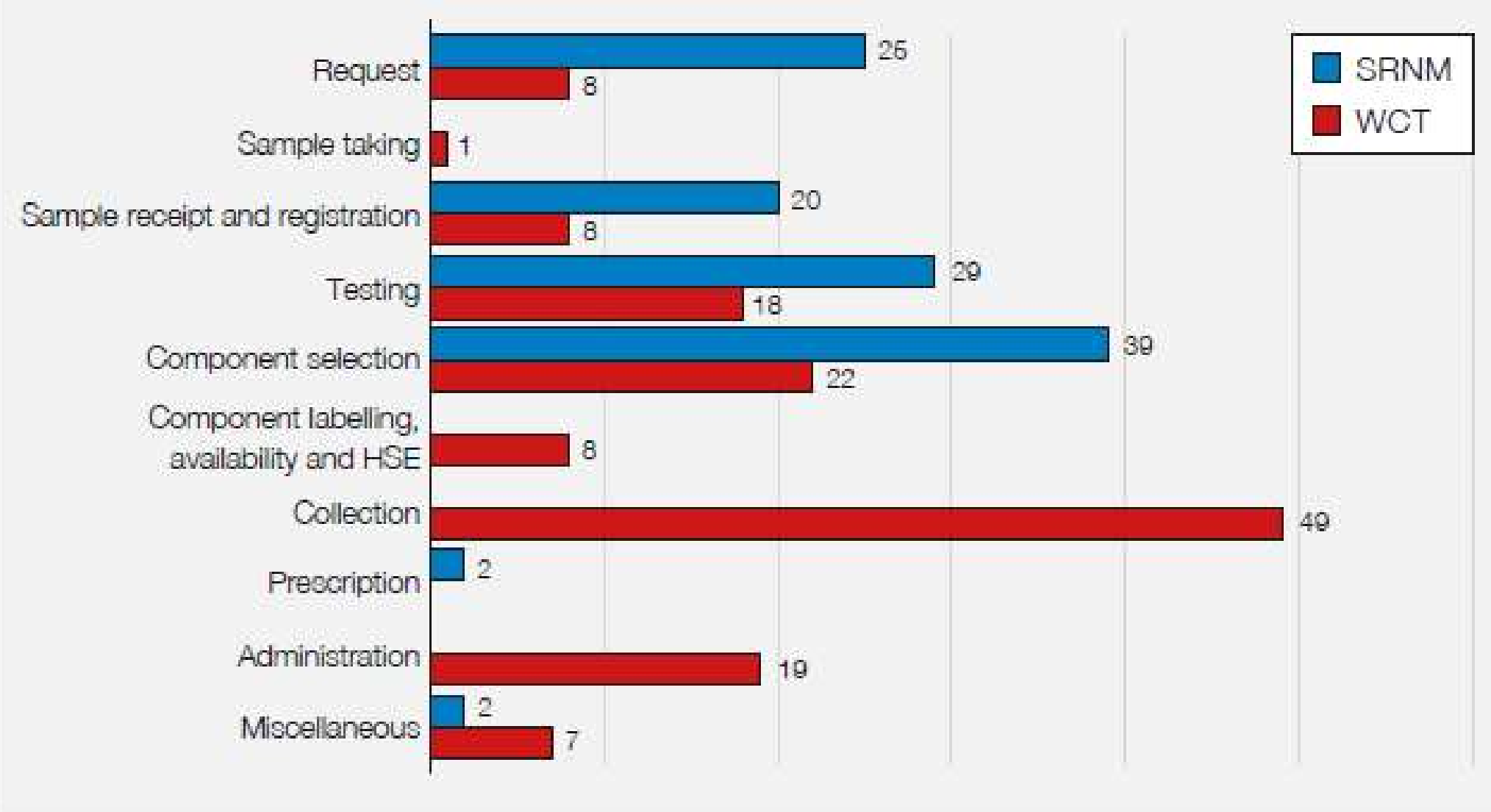
DH=Department of Health; CAS=central alerting system

Overview of reports of near miss IBCT n=257



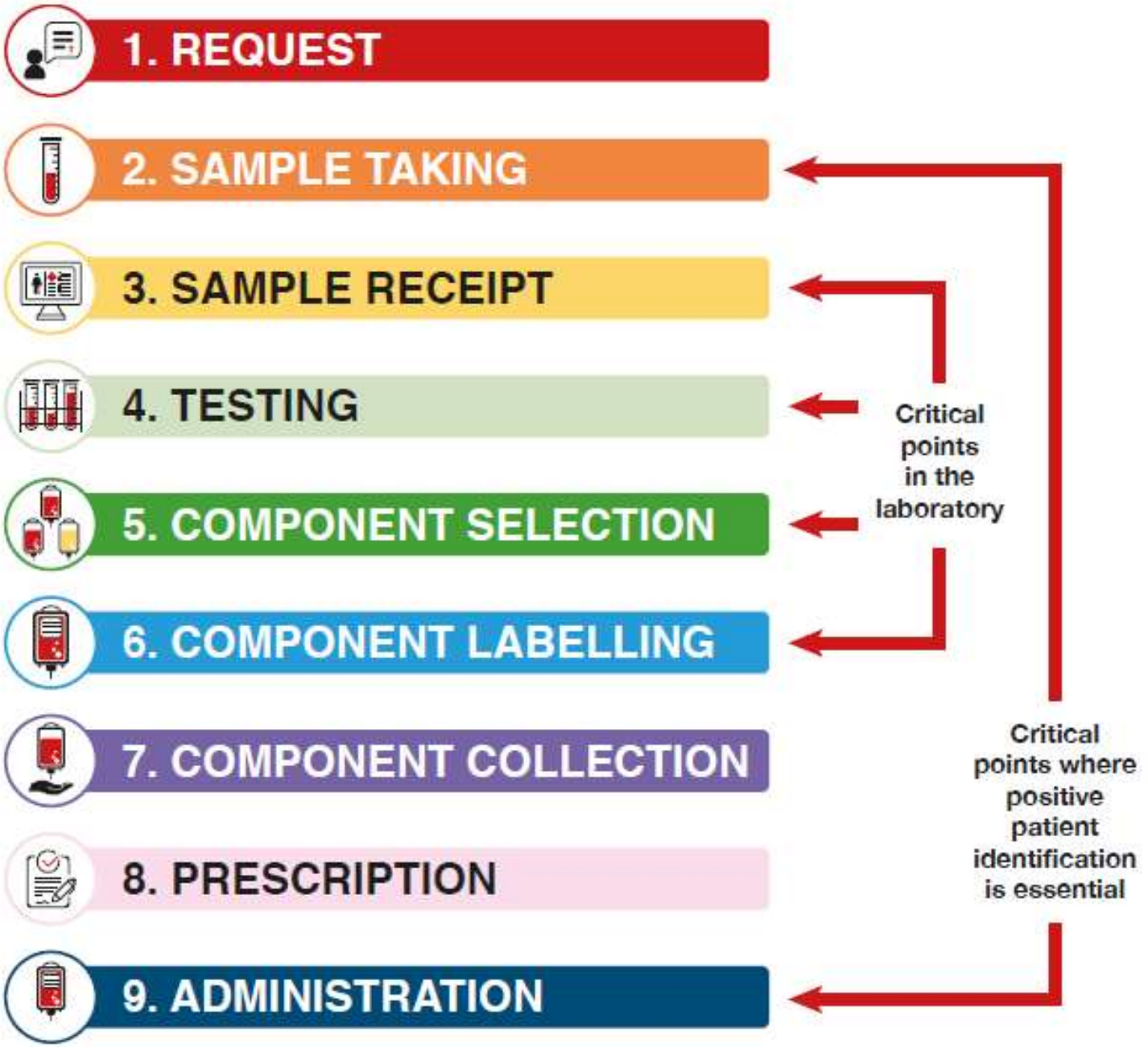
WCT=wrong component transfused; SRNM=specific requirements not met

Points in the transfusion process where the first mistake occurred (clinical and laboratory) leading to near miss



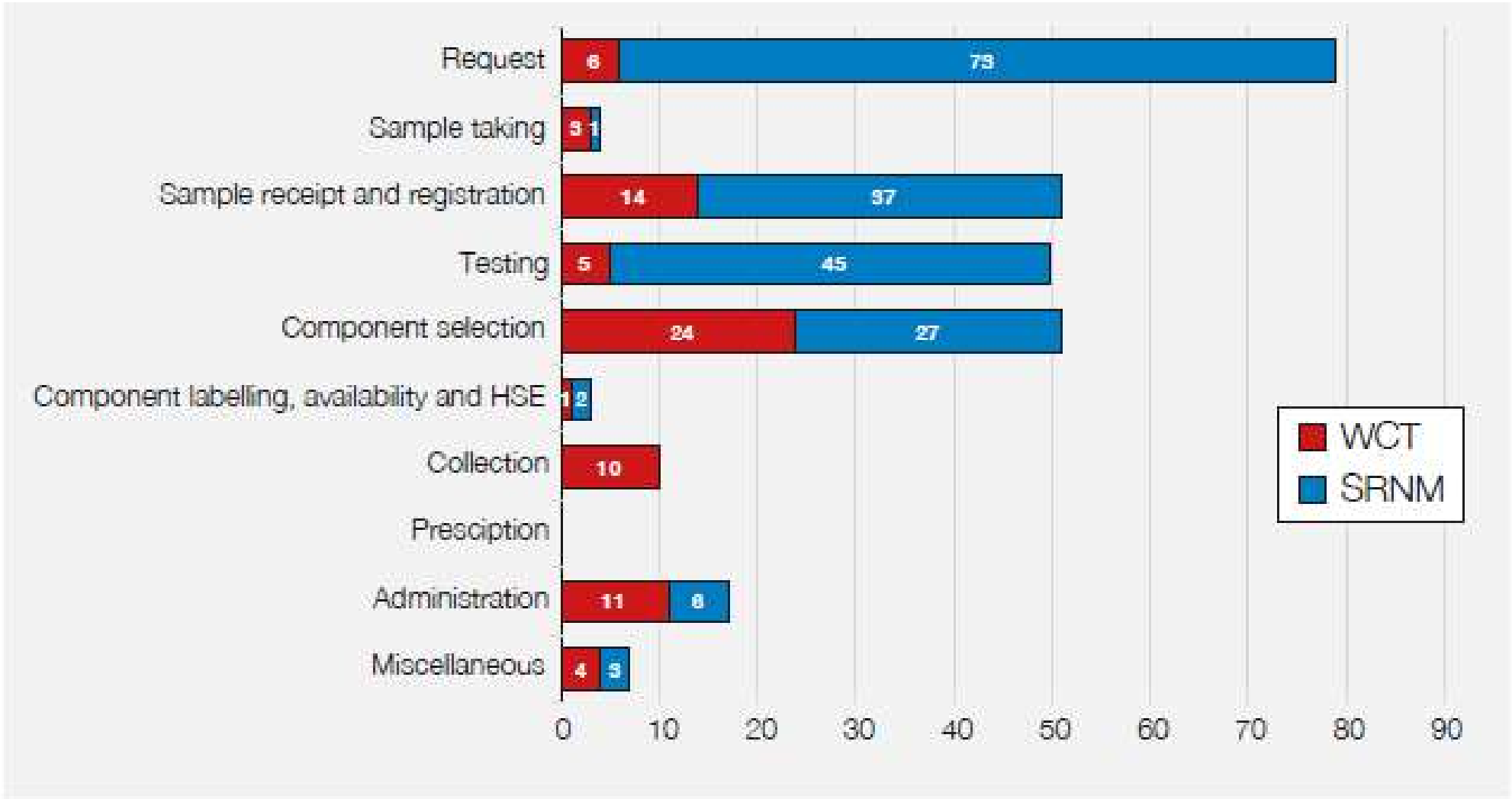
WCT=wrong component transfused; SRNM=specific requirements not met

Transfusion process (nine steps)



Note: Once a decision to transfuse is made, the authorisation or prescription may be written at variable times during this sequence, but ***must be checked at the final stage.***

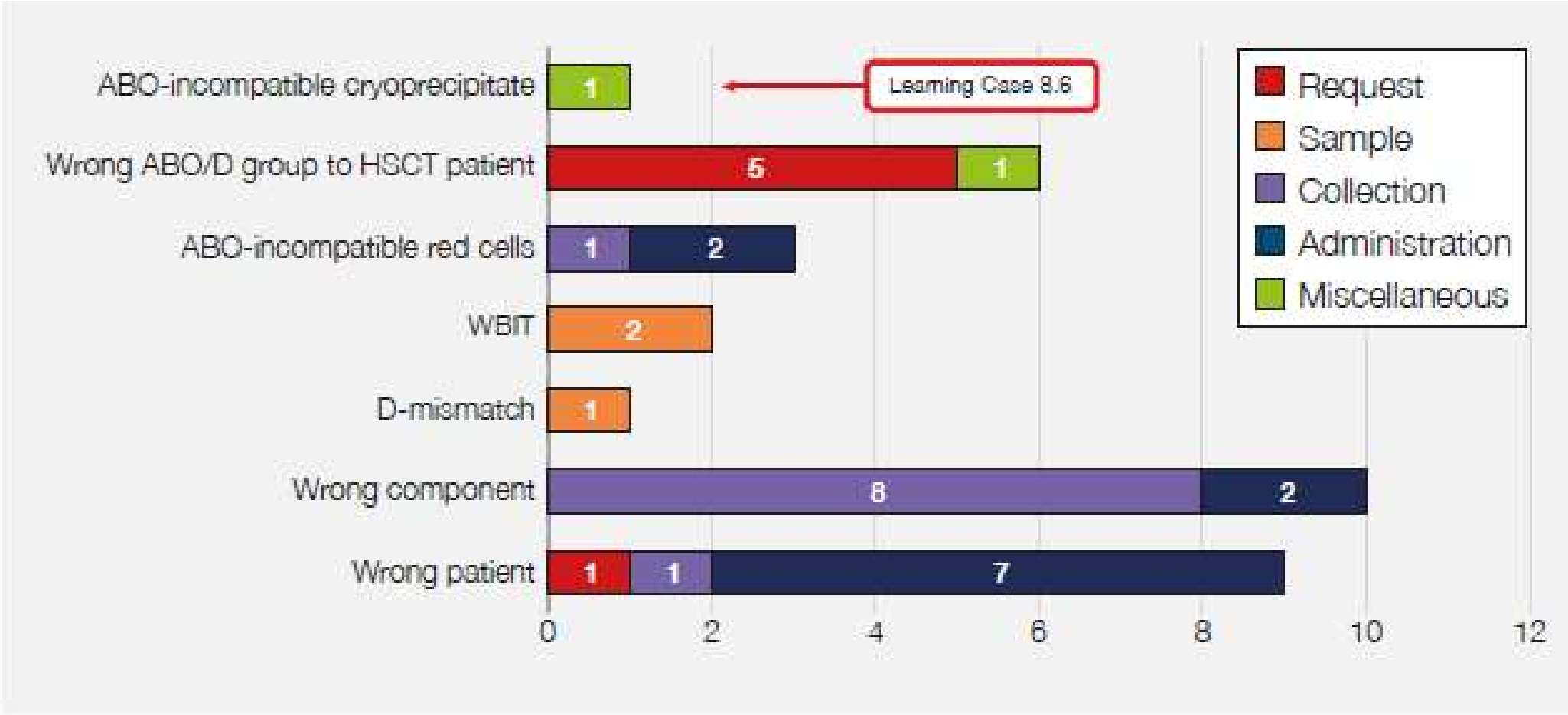
Points in the transfusion process where the first mistake occurred (clinical and laboratory) leading to WCT or SRNM



HSE=handling and storage errors

WCT=wrong component transfused; SRNM=specific requirements not met

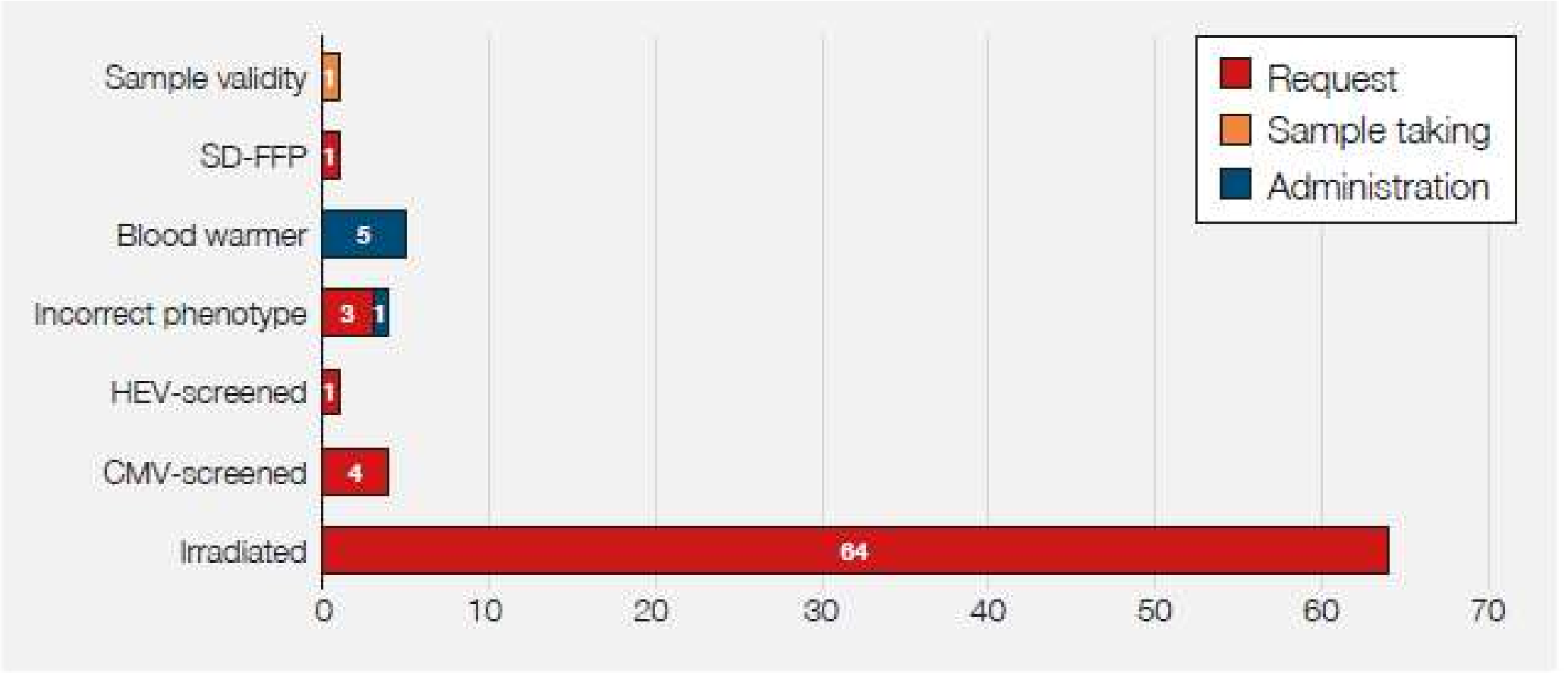
Clinical errors resulting in wrong component transfused n=32



HSCT=haemopoietic stem cell transplant; WBIT=wrong blood in tube

There were no prescription errors reported in 2018

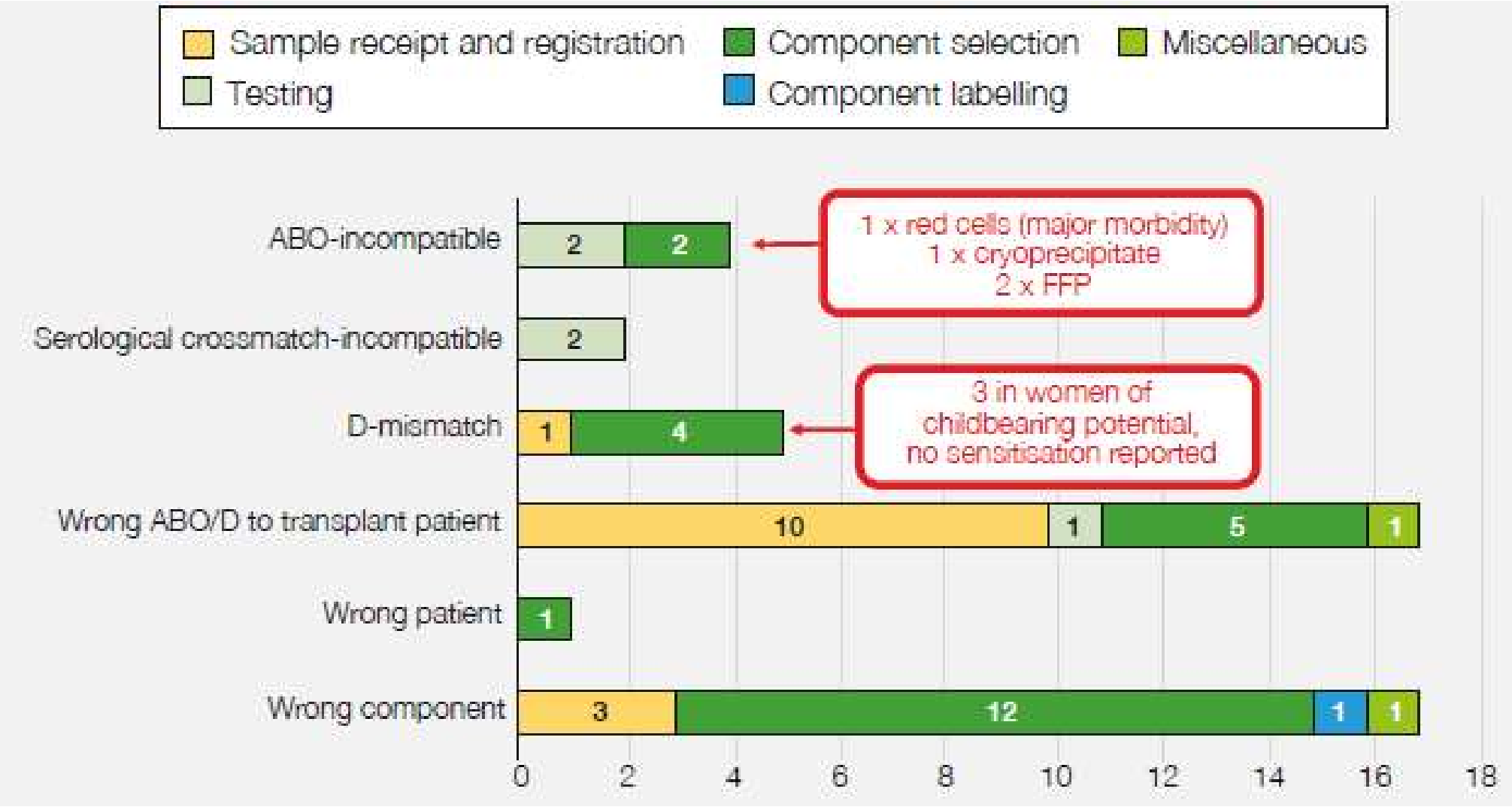
Clinical errors resulting in specific requirements not being met n=80



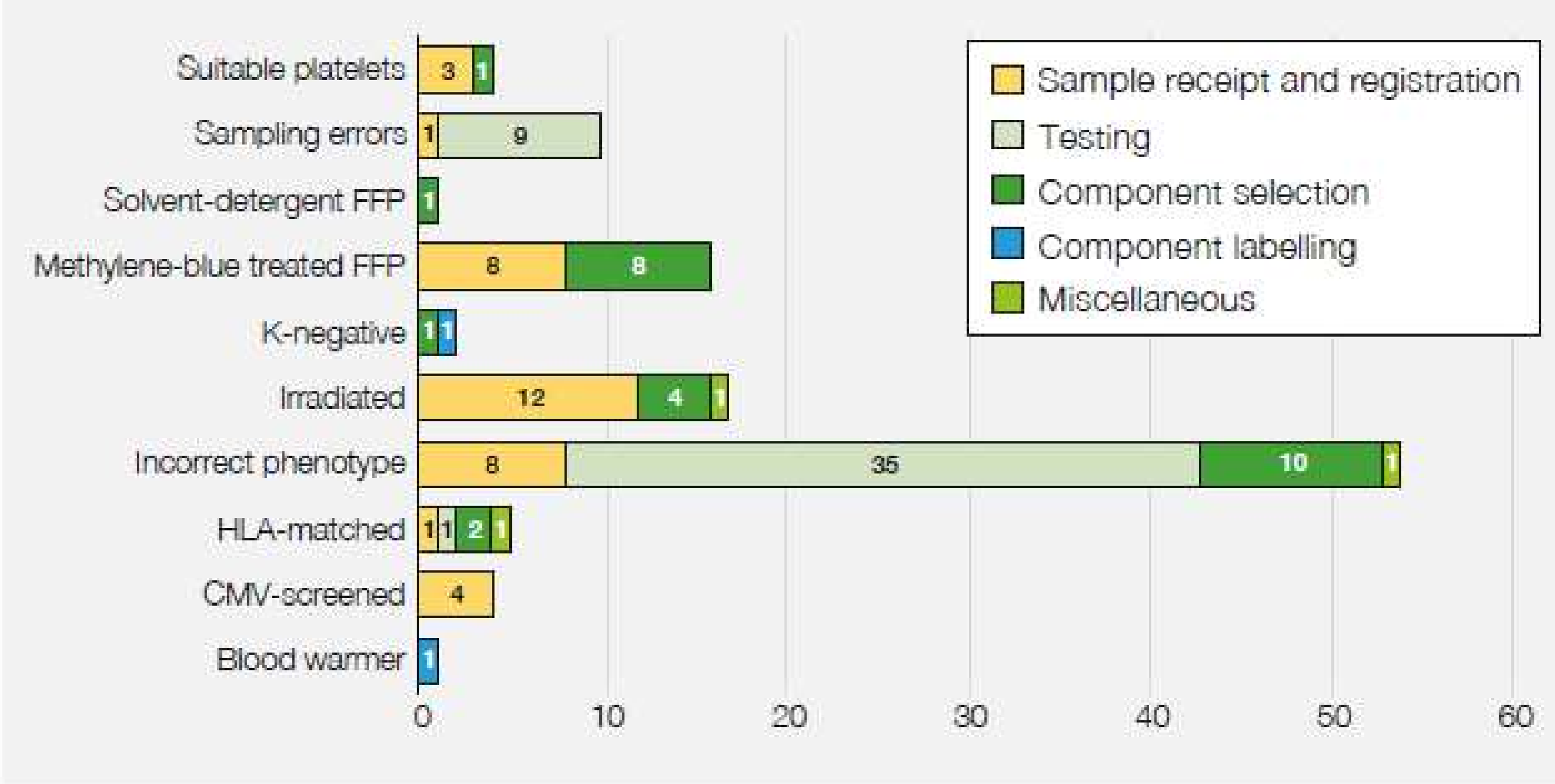
SD-FFP=solvent detergent fresh frozen plasma; HEV=hepatitis E virus; CMV=cytomegalovirus

There were no collection or prescription errors reported in 2018

Laboratory errors resulting in wrong component transfused n=46



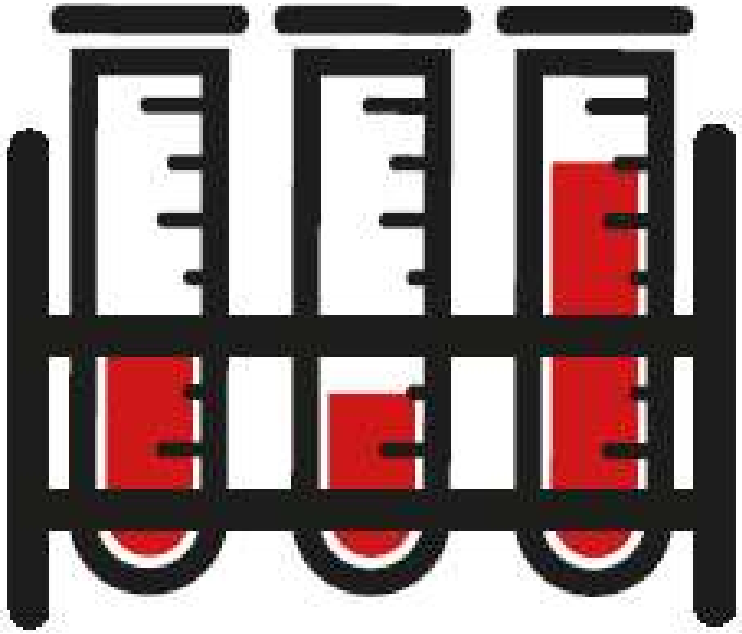
Laboratory errors resulting in specific requirements not being met n=114



FFP=fresh frozen plasma; HLA=human leucocyte antigen; CMV=cytomegalovirus

Reduction in the number of SRNM primary request errors

Summary of sampling cases



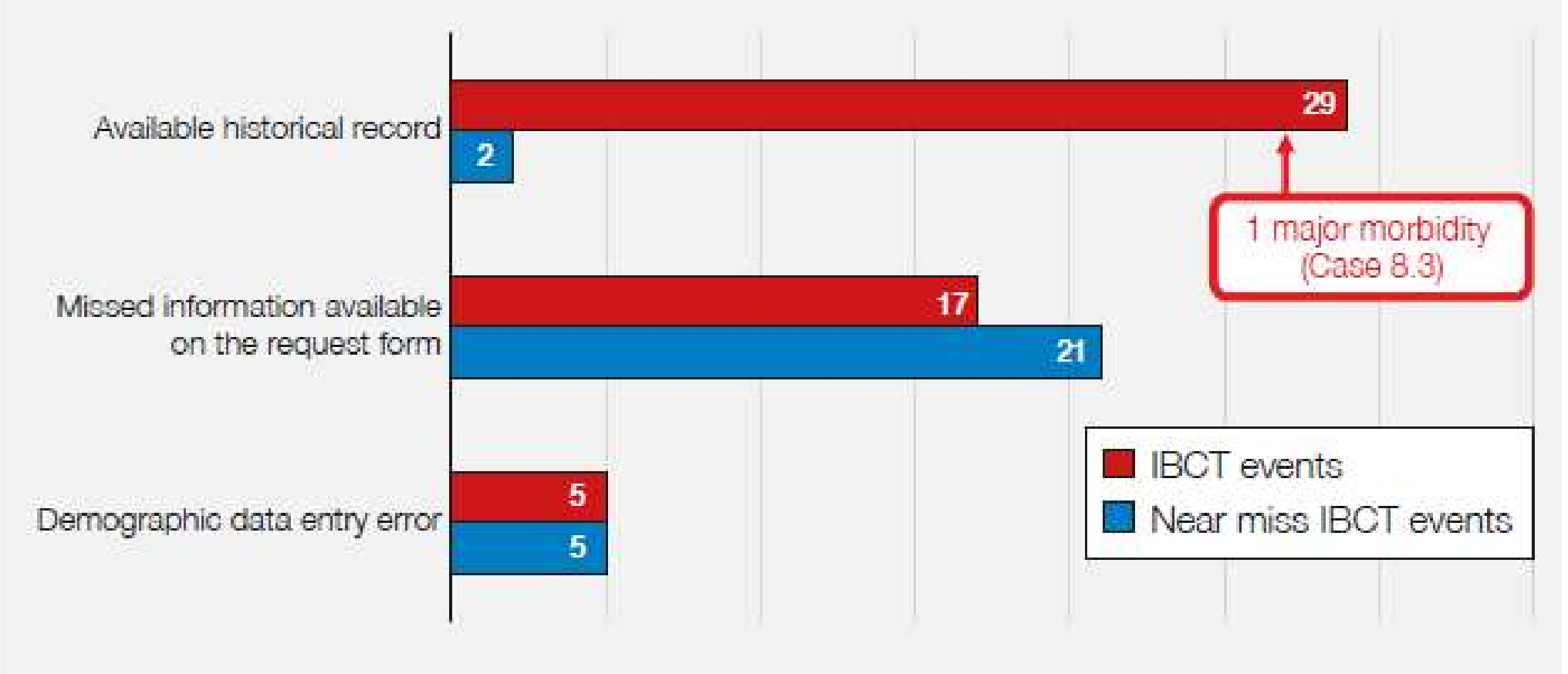
Two separate cases involved a mix up of samples (WBIT) between neonatal twins

One suspected historical case of WBIT led to a D-mismatched transfusion

One case of a sample that was not labelled correctly in the clinical area. The patient's date of birth was written in the 'date taken' box and 'date of birth' box. Not noticed by the laboratory staff and blood was issued and transfused using an invalid sample

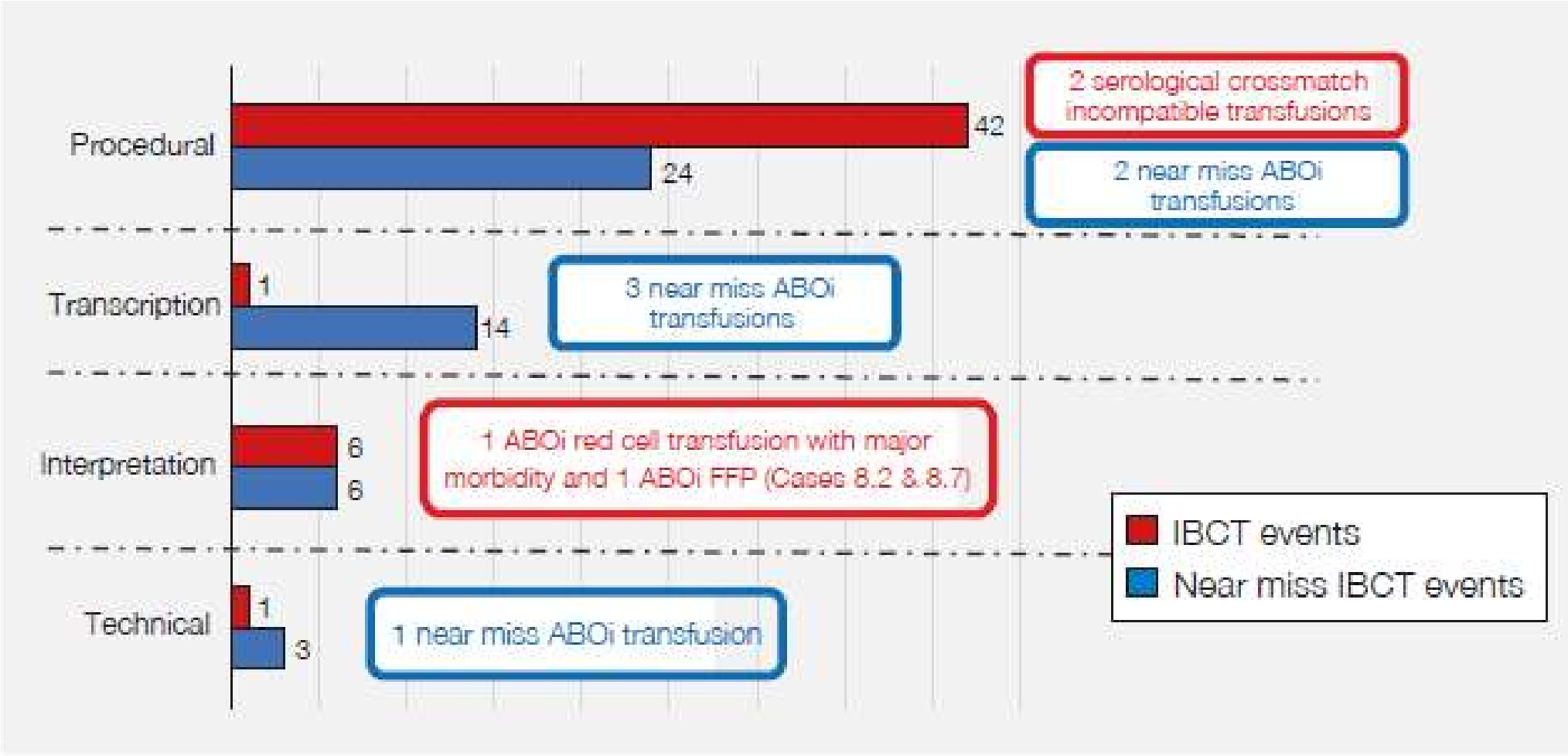
WBIT=wrong blood in tube

Sample receipt and registration errors with outcome n=79



IBCT=incorrect blood component transfused

Testing errors with outcome n=97



ABOi=ABO-incompatible; FFP=fresh frozen plasma

Summary of wrong component type cases

Three cases of wrong 'yellow' (FFP, cryoprecipitate, platelets) components **collected** and administered

Two cases of adult emergency red cell units **collected** and then administered to paediatric patients

One case of a red cell unit **collected** instead of platelets and administered

One case of emergency O D-negative red cells **collected** instead of issued O D-negative (group specific was not available)

One case of platelets **collected** instead of red cells and administered

FFP=fresh frozen plasma

Three cases demonstrating transfusion to the wrong patient

Case 8.9: Use of a 'dependent check' at the administration step leads to transfusion to the wrong patient

A ward sister confirmed the date of birth with the patient against the identification band and prescription. A healthcare assistant (HCA) as the 2nd checker failed to check these details against the compatibility label.

A bedside checklist was not in use in this hospital.

Recommendations – Trust/Health Board to explore if the use of HCA as 2nd checkers for blood administration is appropriate and consider the use of electronic clinical systems

Case 8.10: Use of a 'dependent check' and failure to identify the patient at the administration step leads to transfusion of the wrong patient

Two registered nurses performed a dependent check (one nurse checked the identification band and the other nurse checked the blood component and the prescription). They did not positively identify the patient.

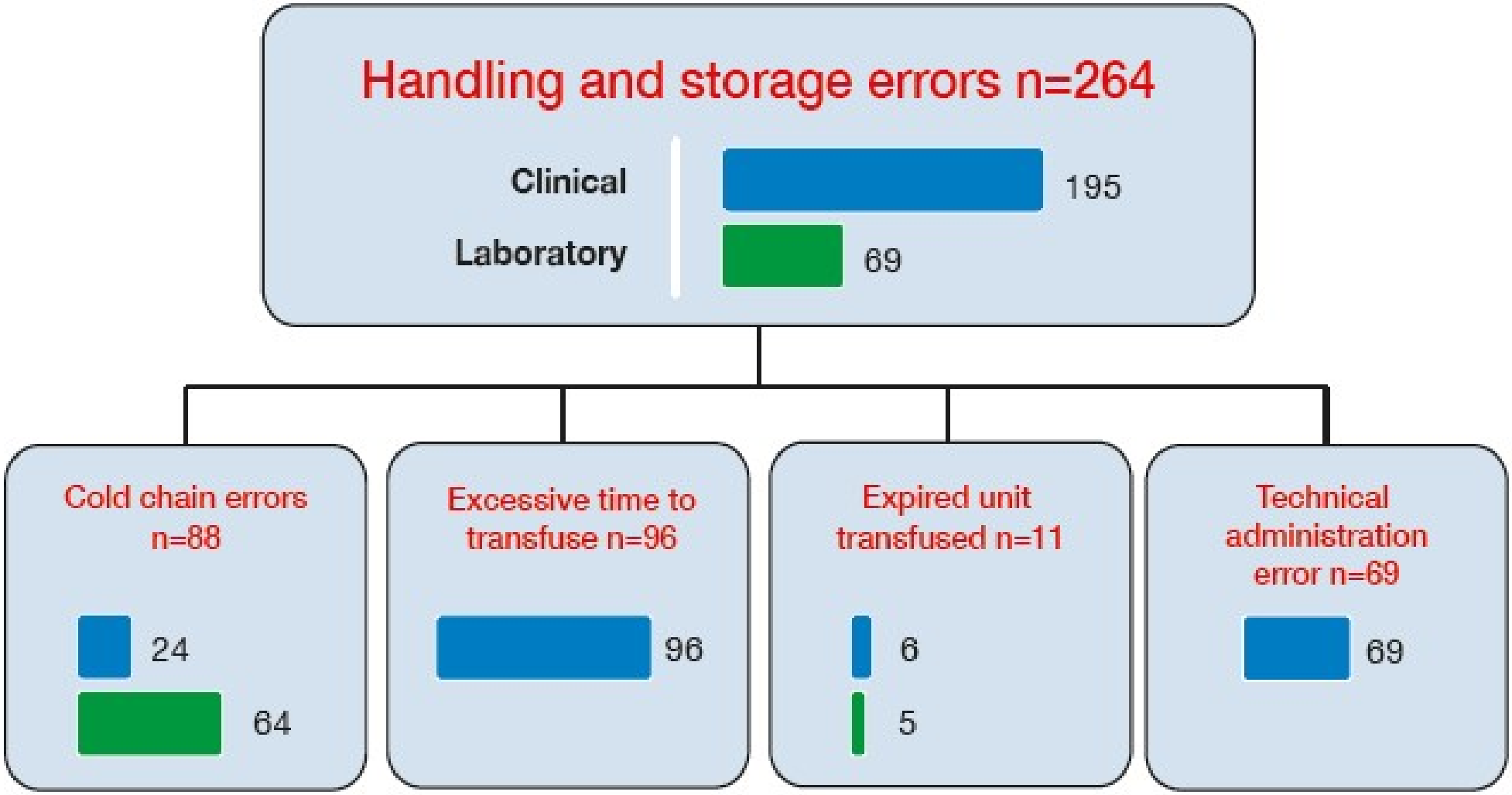
Both were competency-assessed and knew they should perform the check using an independent check. The event took place in the emergency department (ED), and was extremely busy and a shortage of staff was noted

Case 8.11: Transfusion to the wrong patient despite the use of an electronic system to alert staff of an error

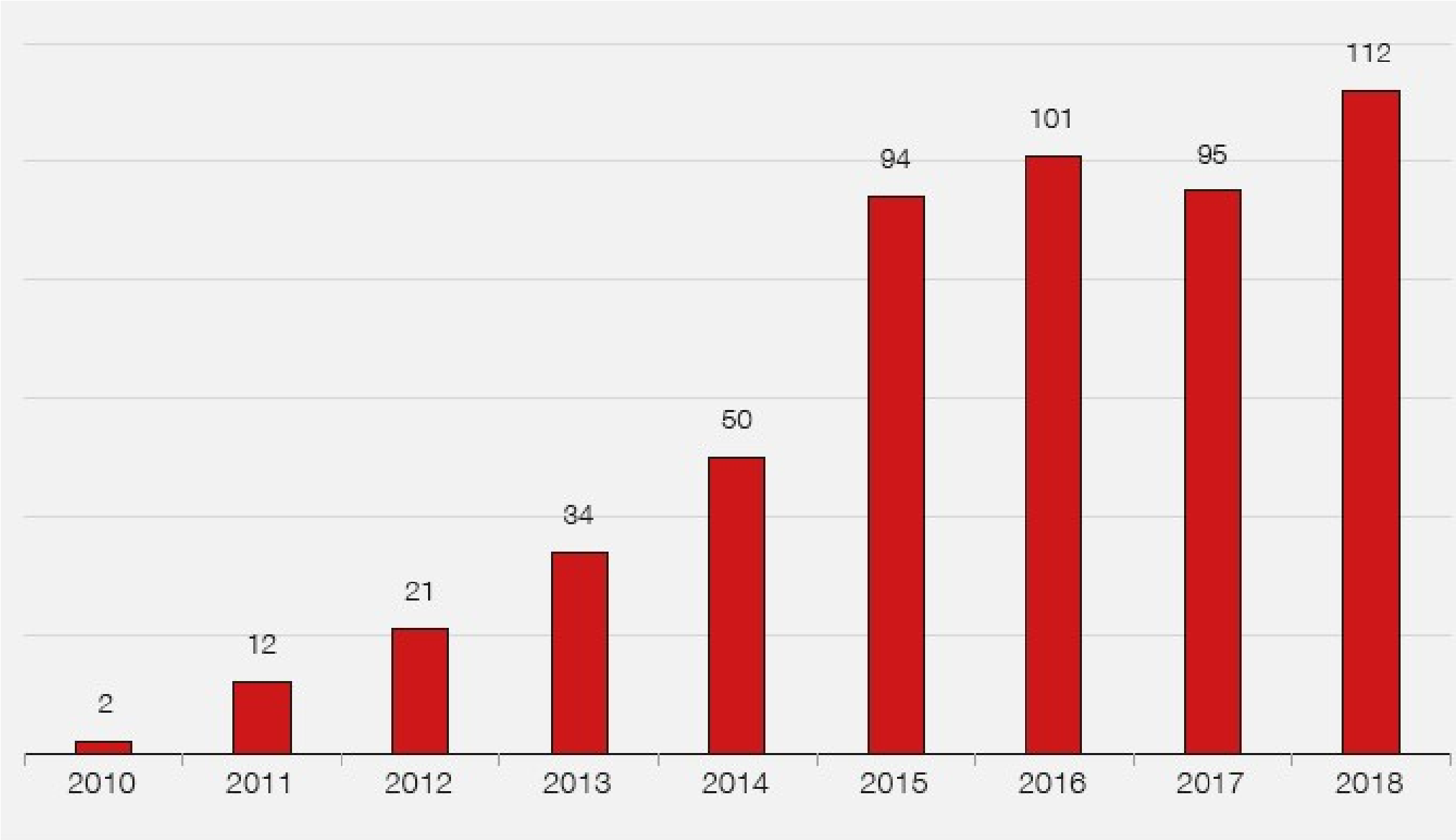
The wrong identification band was placed on a child which was intended for another child that was also due a transfusion that day.

The nurse took a unit of red cells to the child wearing the wrong identification band. Although there was an electronic prompt to carry out a verbal positive identification check, this did not take place. The electronic system was unable to alert the nurse this was the wrong patient because the unit matched the wristband

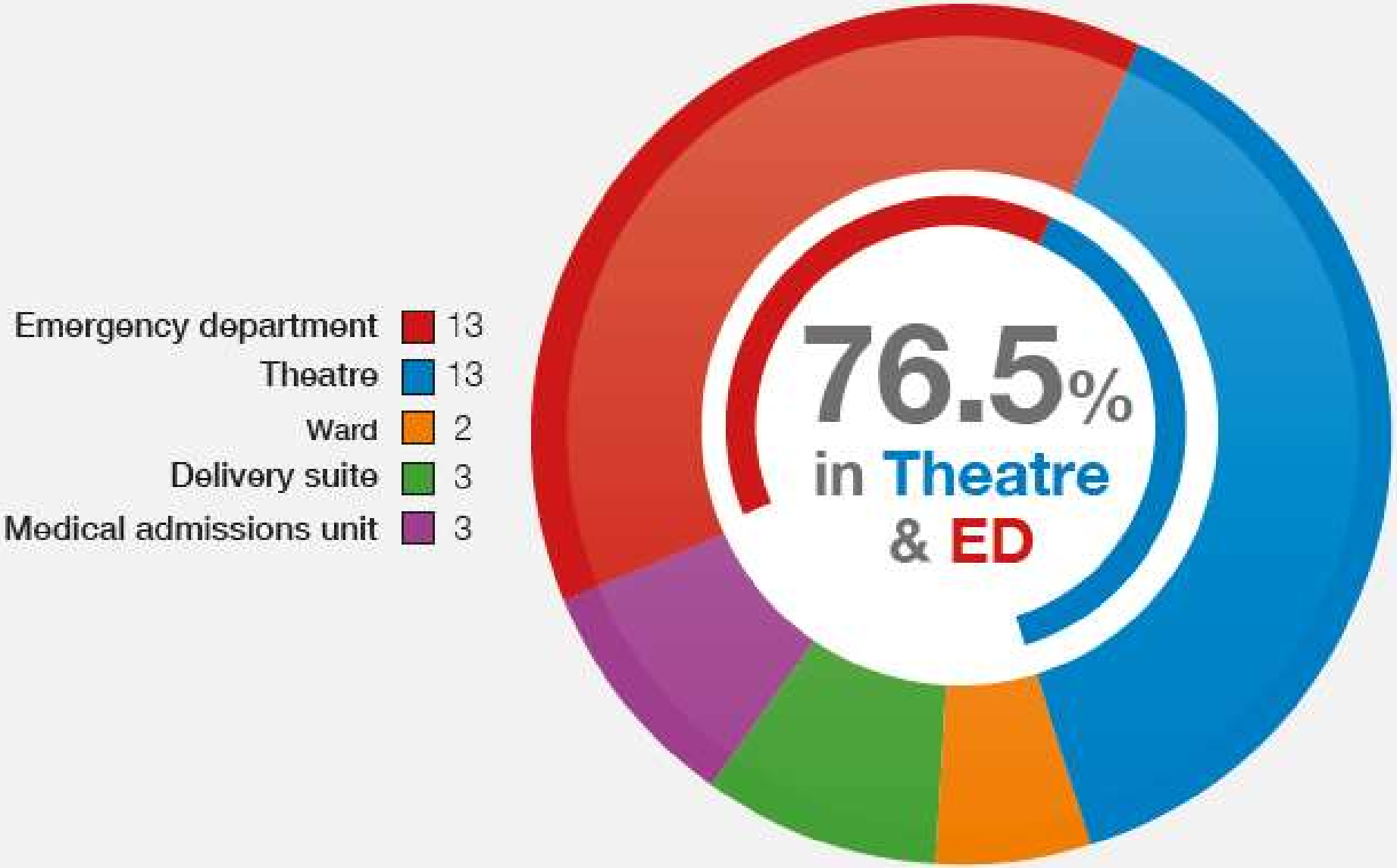
Breakdown of 2018 HSE reports n=264



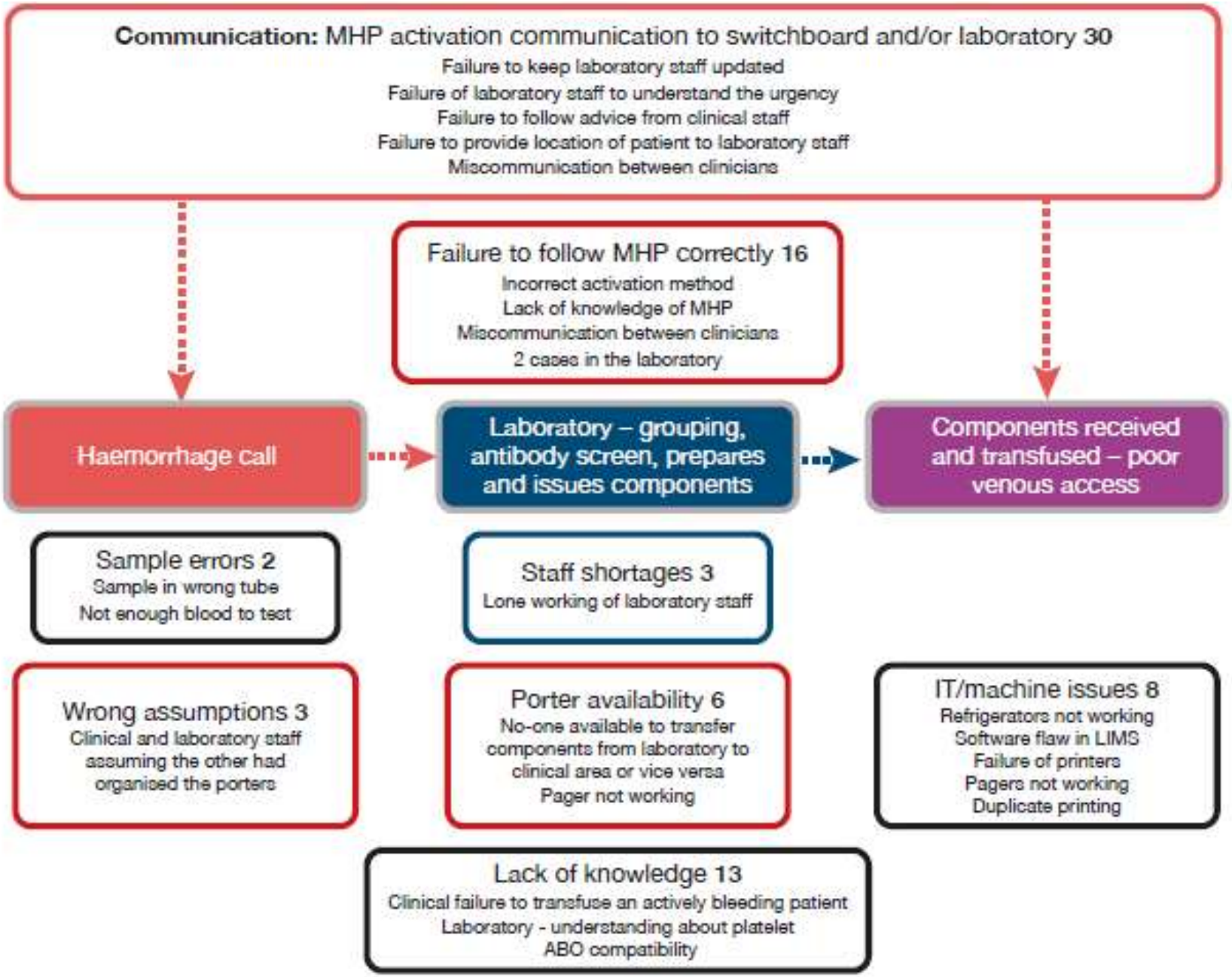
Delayed transfusion reports by year 2010-2018



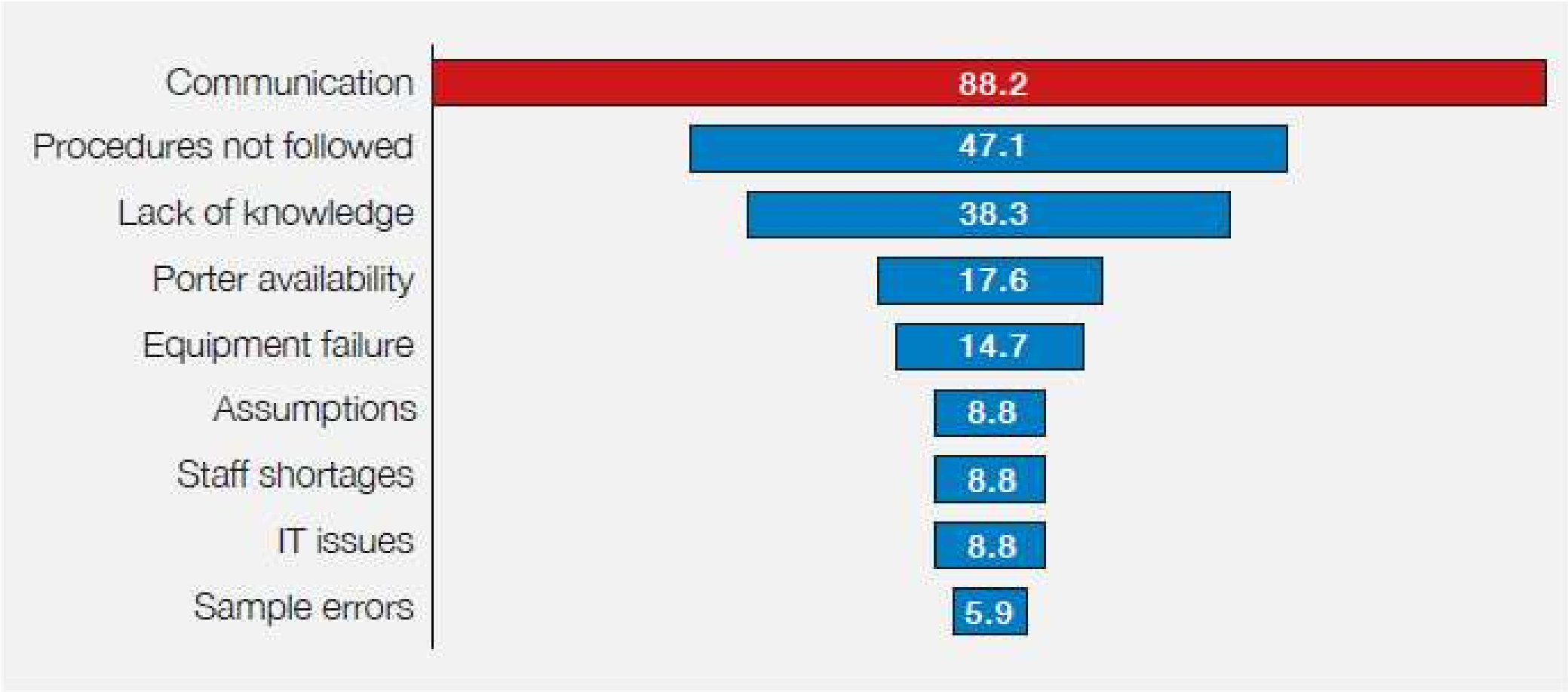
Location of major haemorrhage incidents



Holdup points identified in the major haemorrhage transfusion pathway



Poor communication is the most common factor contributing to errors in MHP-related reports
(results as %)



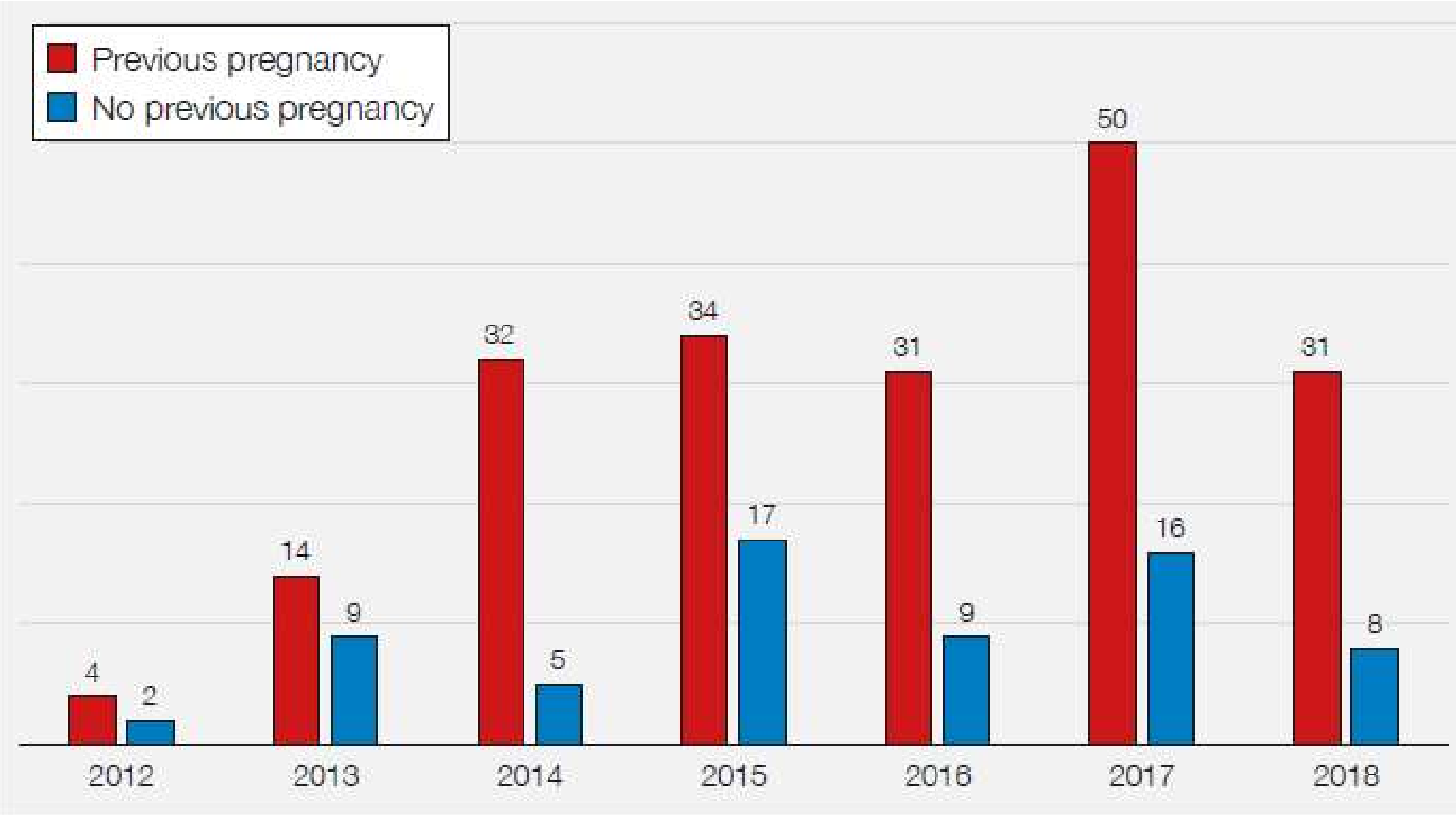
IT=information technology

Blood gas result illustrating the difference between total Hb (A) and HHb (B)

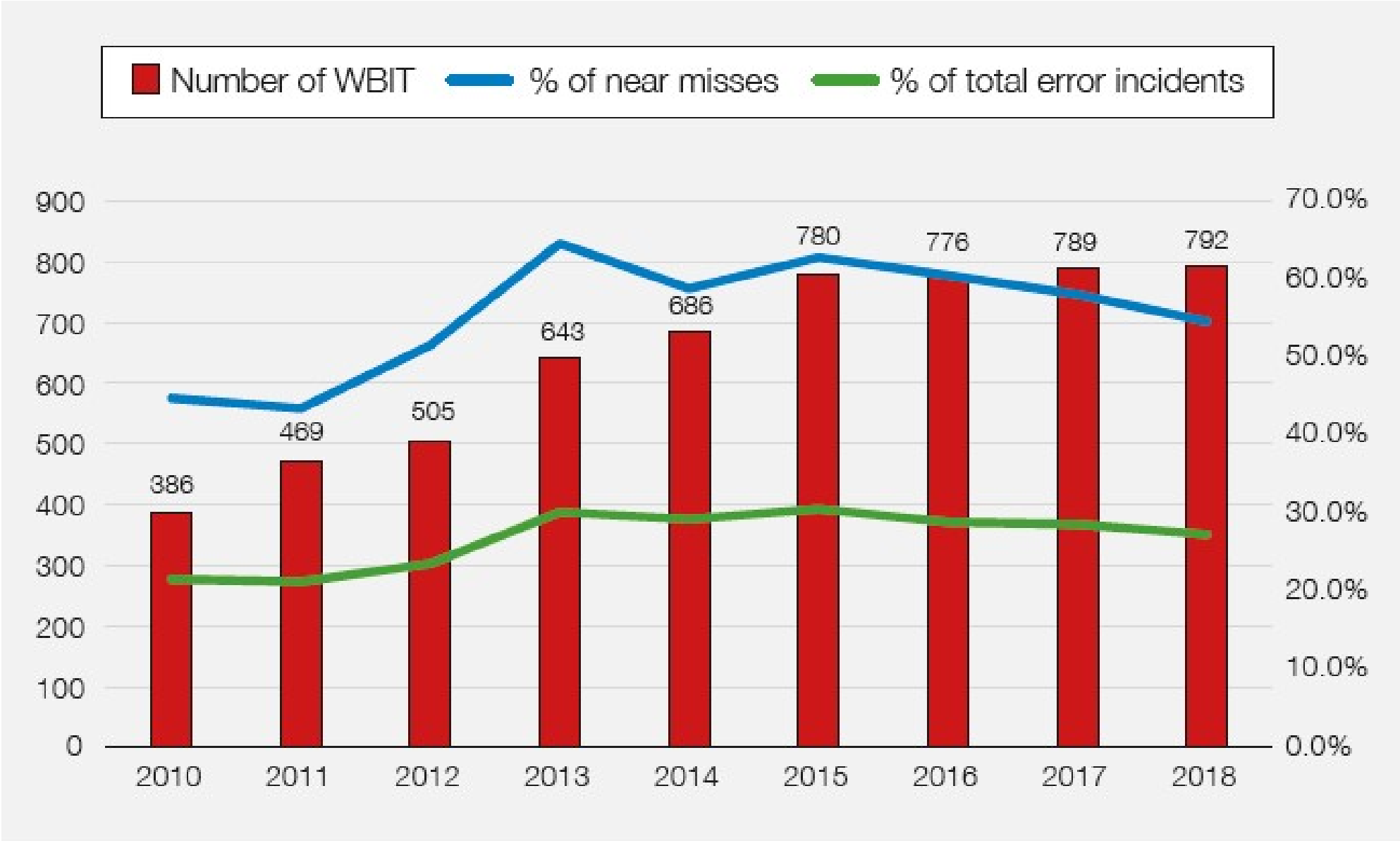
Results				Crit. Low	Reference Low	Reference High	Crit. High
Measured (37.0°C)							
pH		7.37		[7.20	7.35	7.45	7.60]
pCO_2	↑	6.8	kPa	[2.6	4.3	6.4	9.3]
pO_2	↓	9.0	kPa	[6.0	11.0	14.4	--]
Na^+	↓	135	mmol/L	[120	136	145	160]
K^+		4.2	mmol/L	[2.8	3.5	5.1	6.5]
Cl^-		99	mmol/L	[80	98	107	120]
Ca^{++}		1.19	mmol/L	[0.75	1.15	1.33	1.60]
Hct	↓	35	%	[18	37	50	60]
Glu	↑	14.4	mmol/L	[2.5	3.6	5.3	25.0]
Lac	↑	2.3	mmol/L	[--	0.3	2.0	4.0]
CO-Oximetry							
A tHb	↓	110	g/L	[70	117	174	200]
O_2Hb		92.5	%	[--	90.0	95.0	--]
COHb		1.3	%	[--	0.0	3.0	10.0]
MetHb		0.8	%	[--	0.0	1.5	--]
B HHb	↑	5.4	%	[--	1.0	5.0	--]
sO_2		94.5	%	[--	94.0	98.0	--]
Derived							
BE(B)	↑	3.1	mmol/L	[--	-2.0	3.0	--]
HCO_3^-std		27.3	mmol/L	[10.0	21.0	28.0	40.0]

↑↓ Outside Reference Range

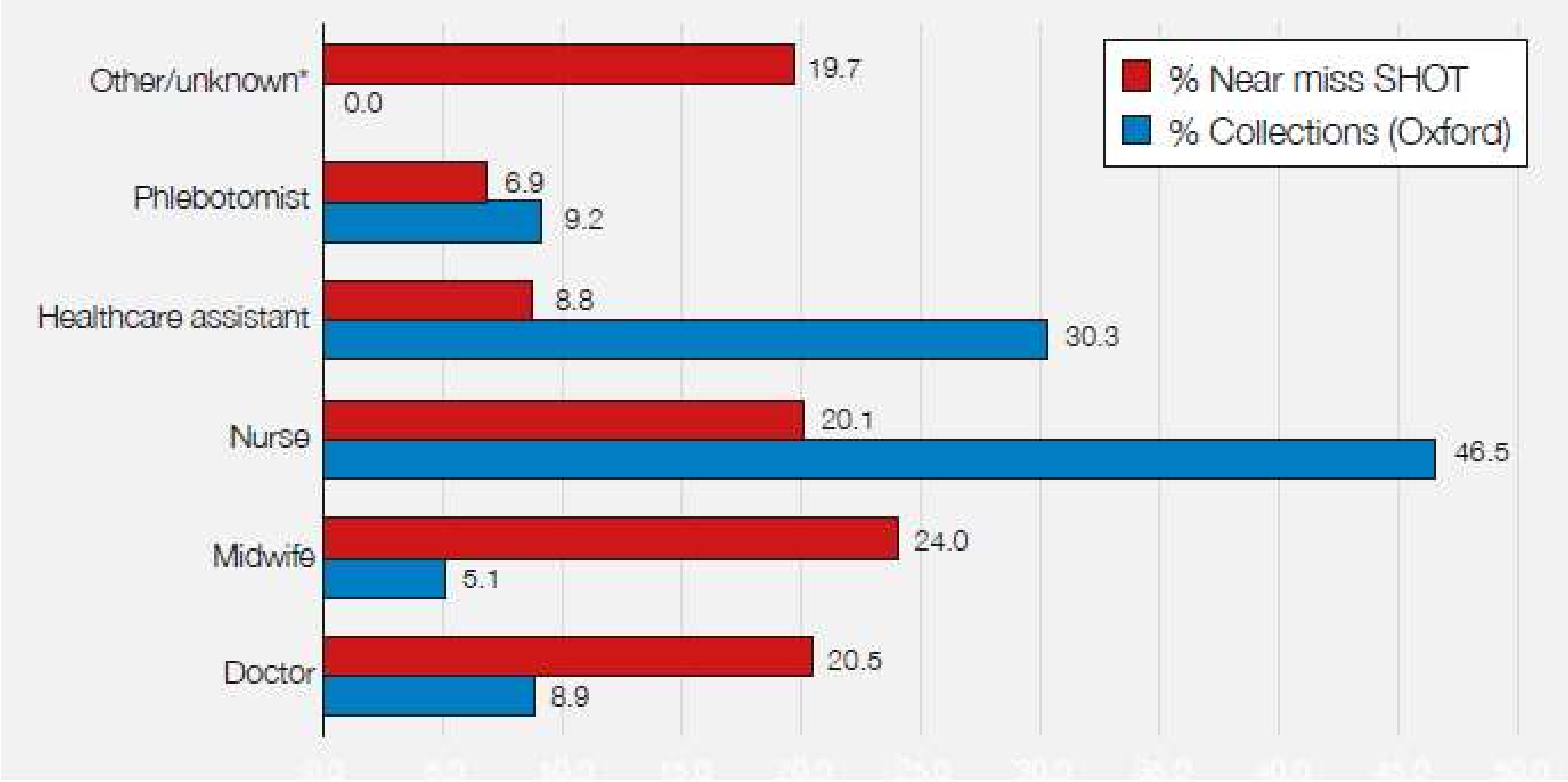
Number of reports of anti-D immunisation in pregnancy by year, 2012-2018



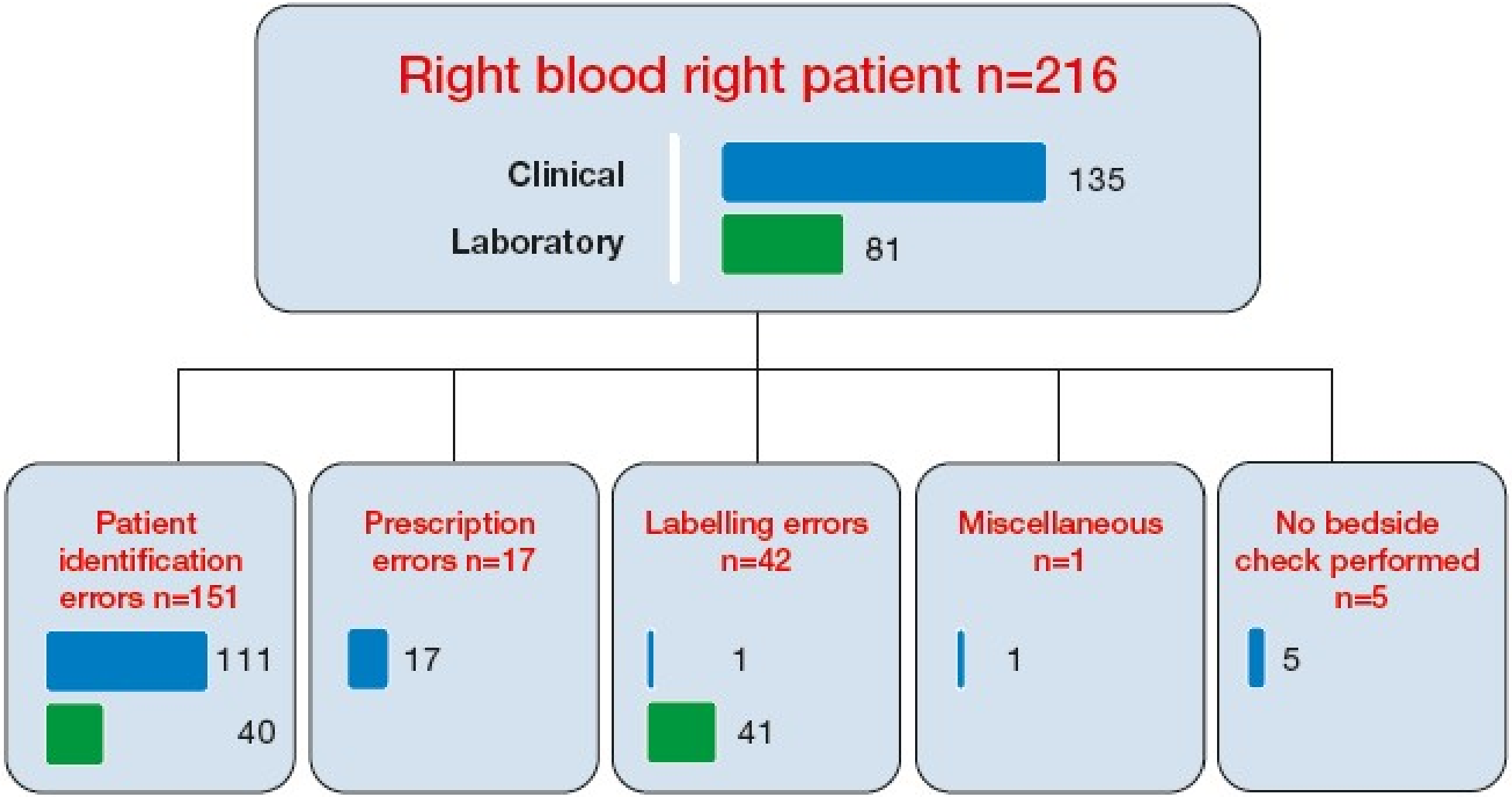
Reports of WBIT 2010 to 2018



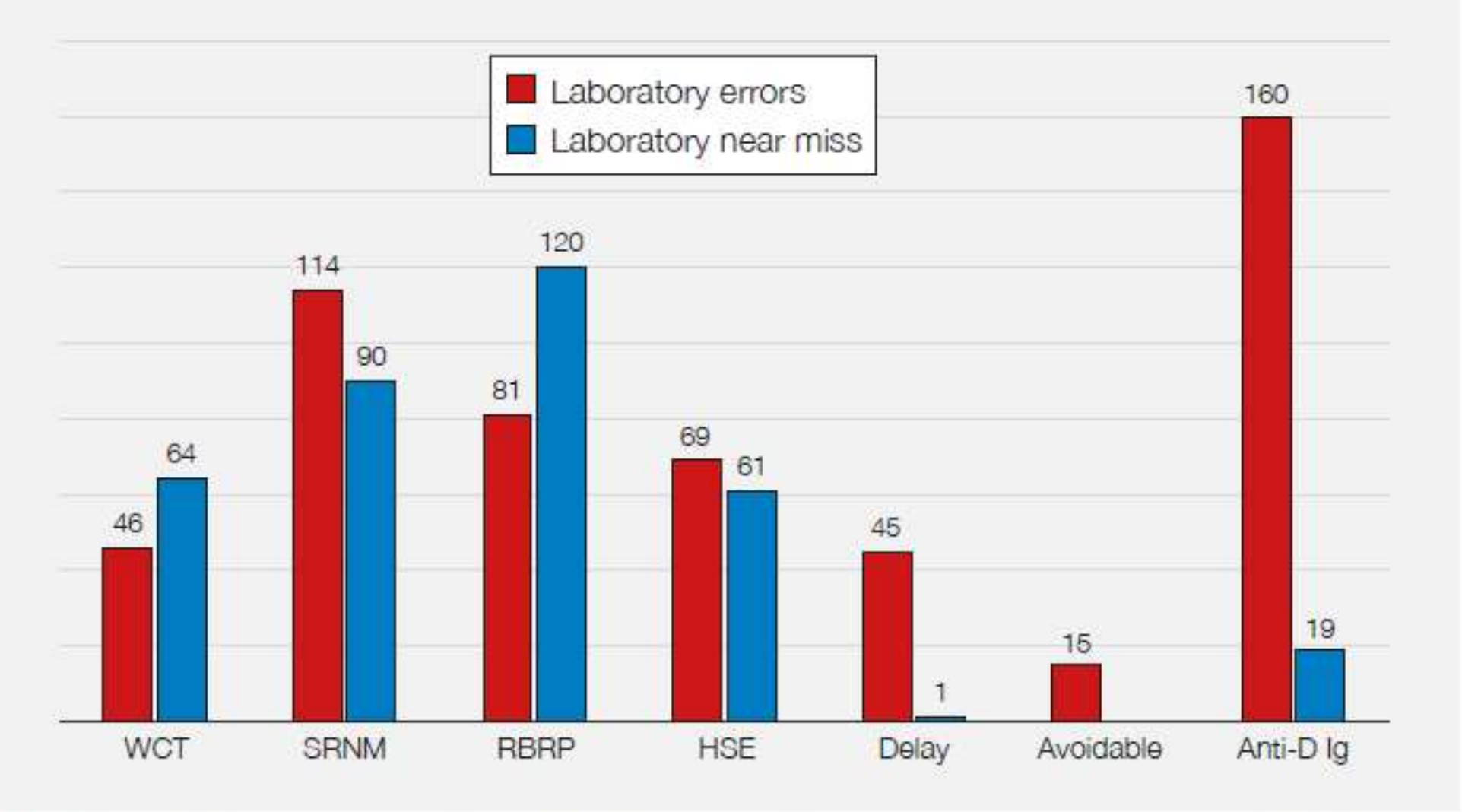
Staff groups responsible for taking the WBIT samples reported to SHOT (n=792) compared with staff groups who take transfusion samples in Oxford Hospitals January to March 2019 (n=15619)



Breakdown of 2018 RBRP reports n=216

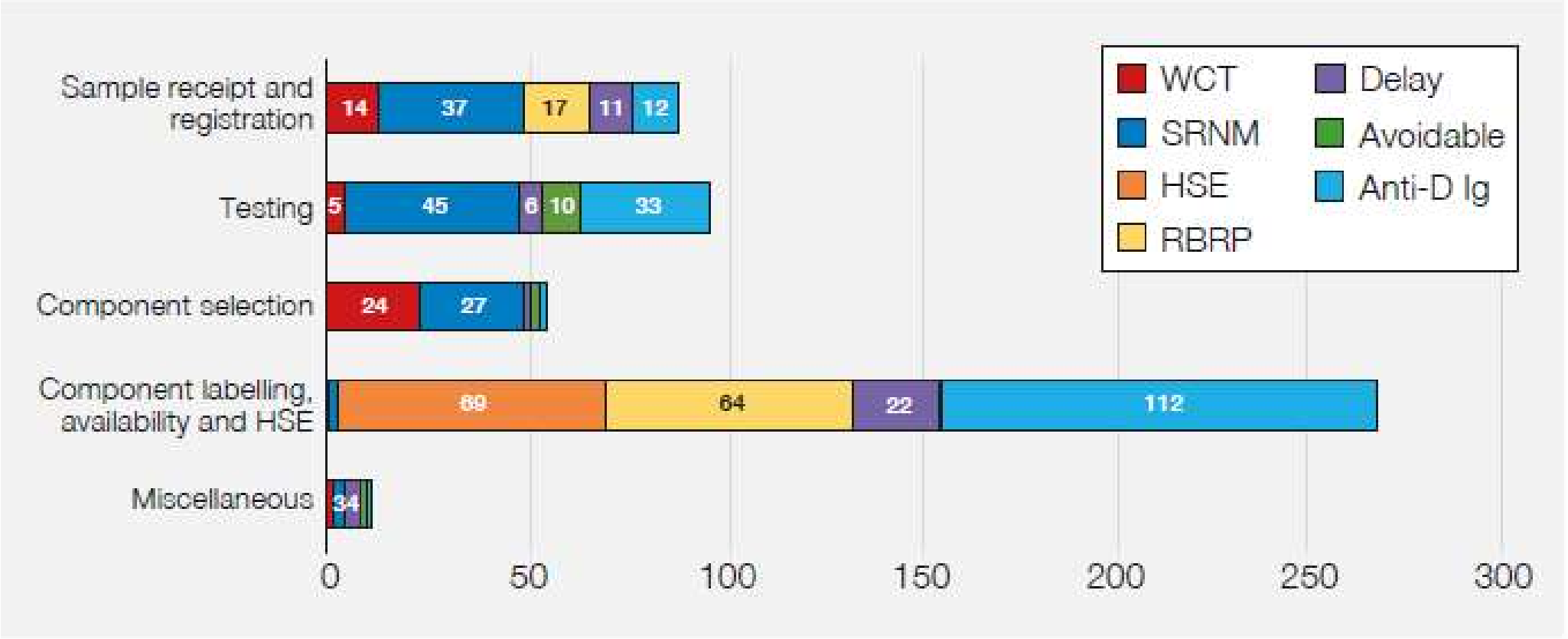


Laboratory incidents and near misses by category of outcome n=885



WCT=wrong component transfused; SRNM=specific requirements not met; HSE=handling and storage errors; RBRP=right blood right patient; Ig=immunoglobulin

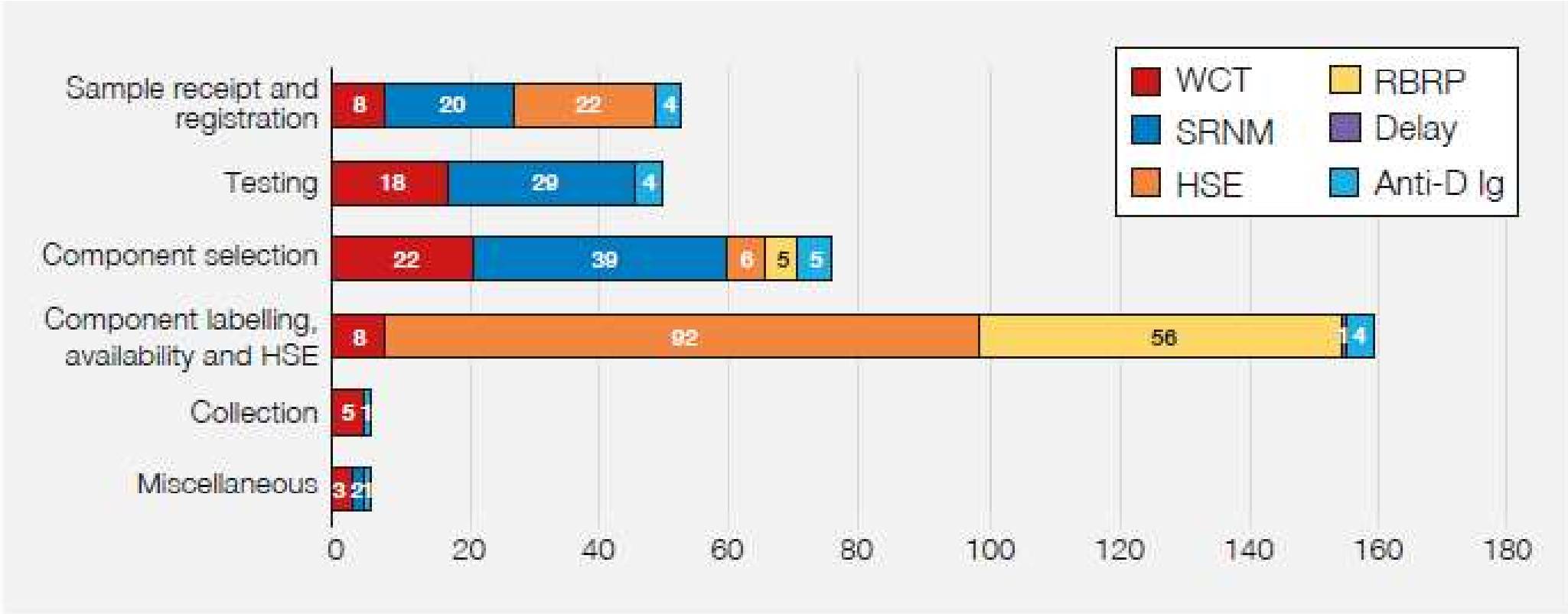
SHOT laboratory data (n=530) showing at which stage in the transfusion process the primary error occurred



WCT=wrong component transfused; SRNM=specific requirements not met; HSE=handling and storage errors; RBRP=right blood right patient; Ig=immunoglobulin

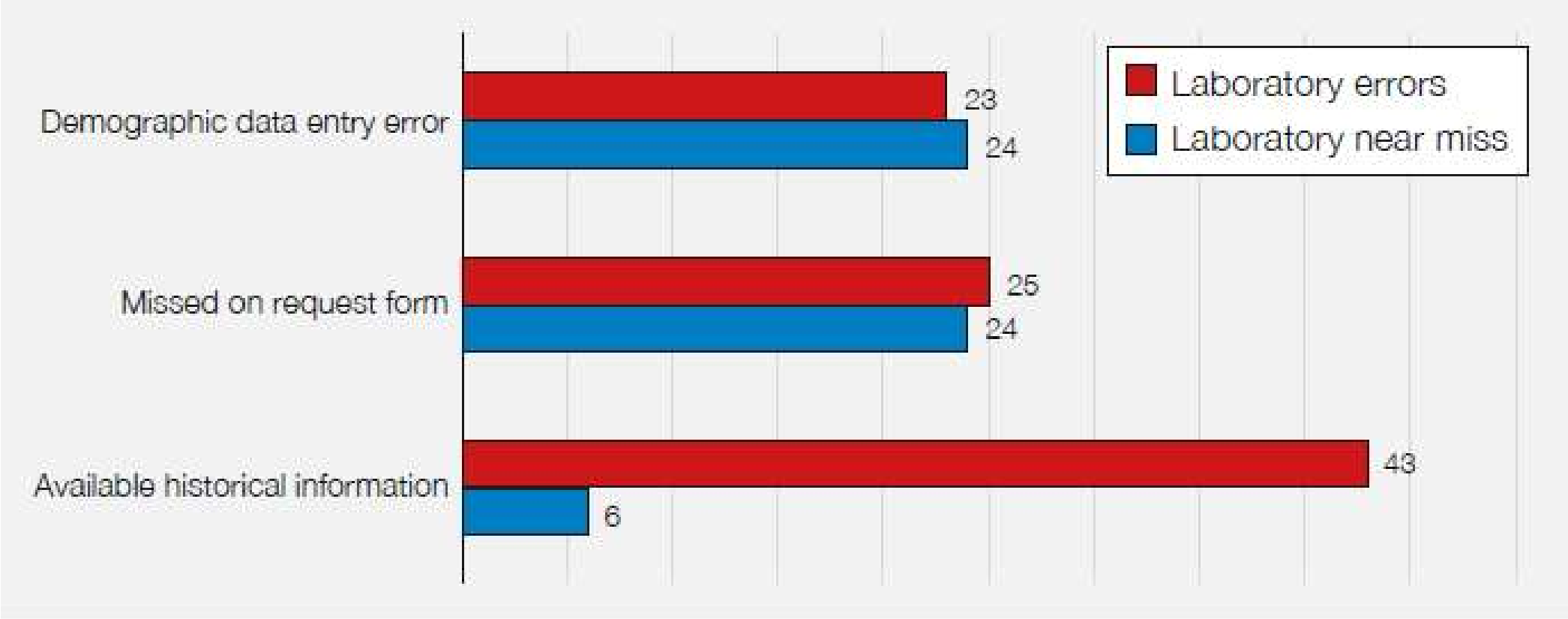
Numbers <3 are too small to be annotated on the figure: Component selection: delay=2; avoidable=2, anti-D Ig=2; Component labelling, availability and HSE: WCT=1; SRNM=2; avoidable=1; Miscellaneous: WCT=2, avoidable=2, anti-D Ig=1

SHOT near miss laboratory errors (n=355) showing at which stage in the transfusion process the primary error occurred with outcome

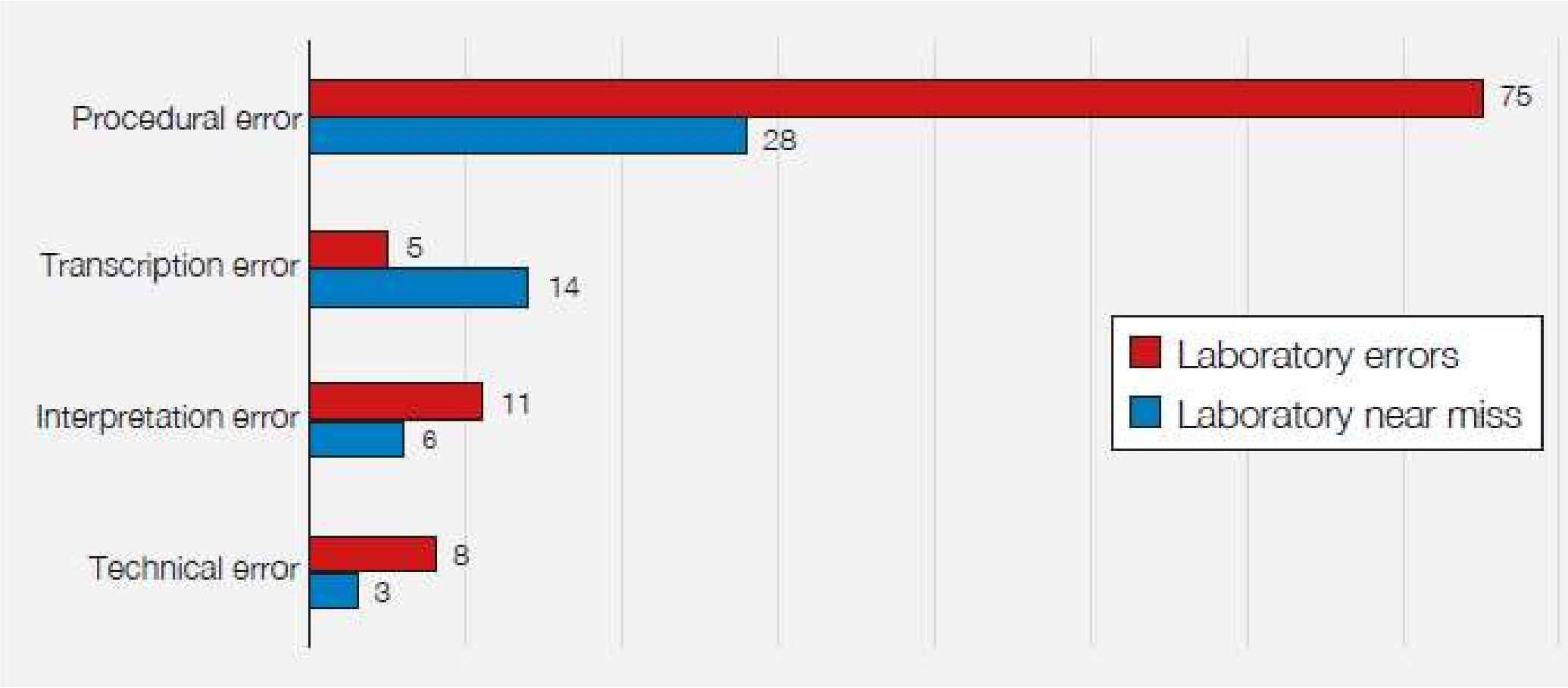


WCT=wrong component transfused; SRNM=specific requirements not met; HSE=handling and storage errors; RBRP=right blood right patient; Ig=immunoglobulin

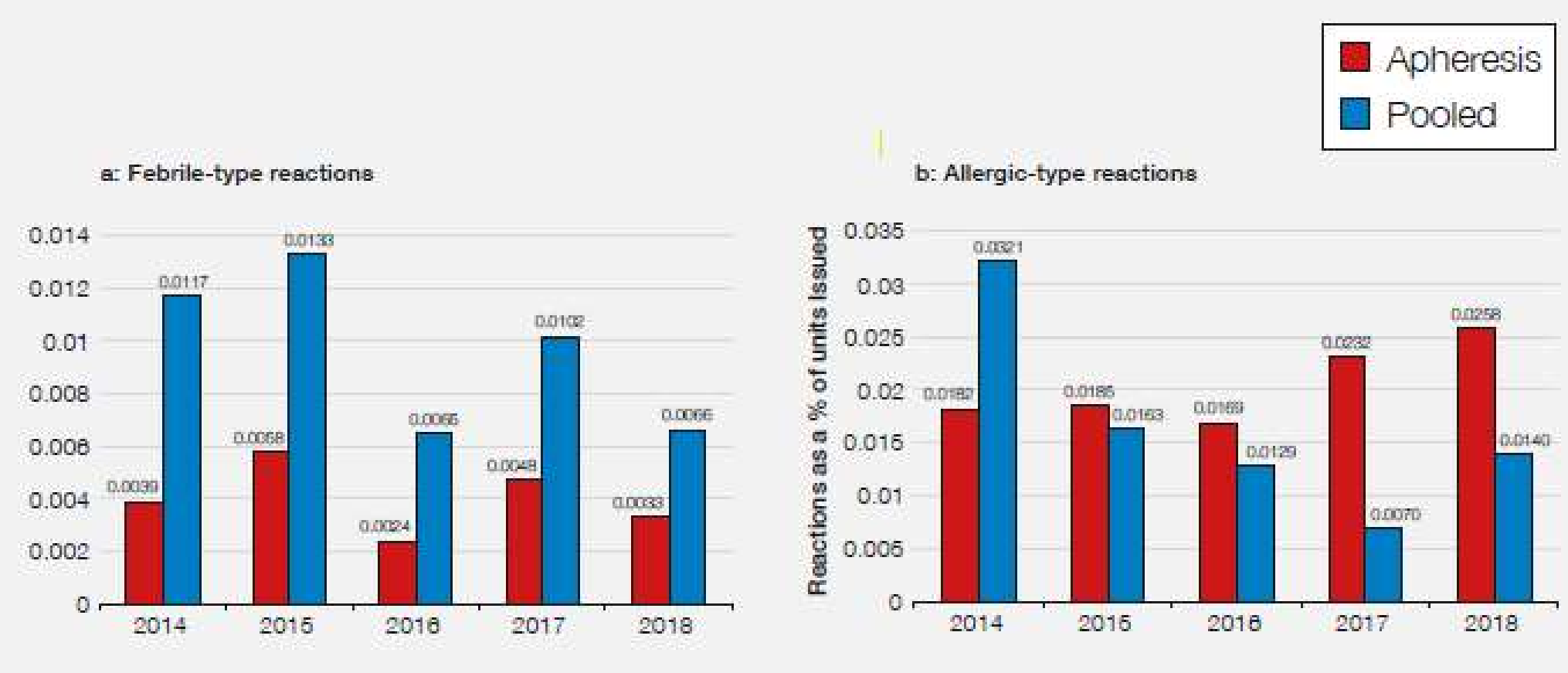
Sample receipt and registration errors with outcome n=145



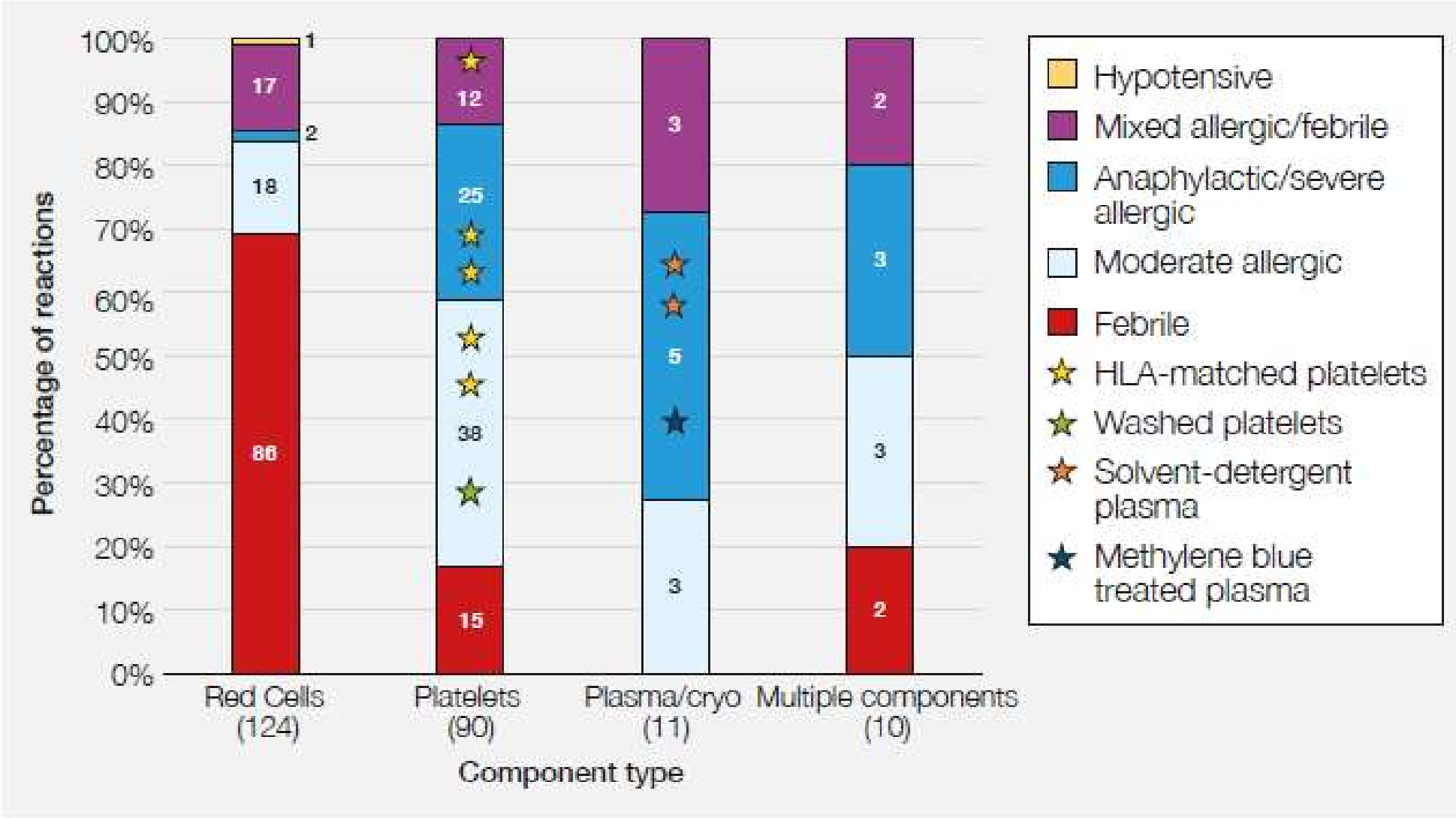
Testing errors with outcome n=150



Percentage of reactions to apheresis and pooled platelets 2014 to 2018



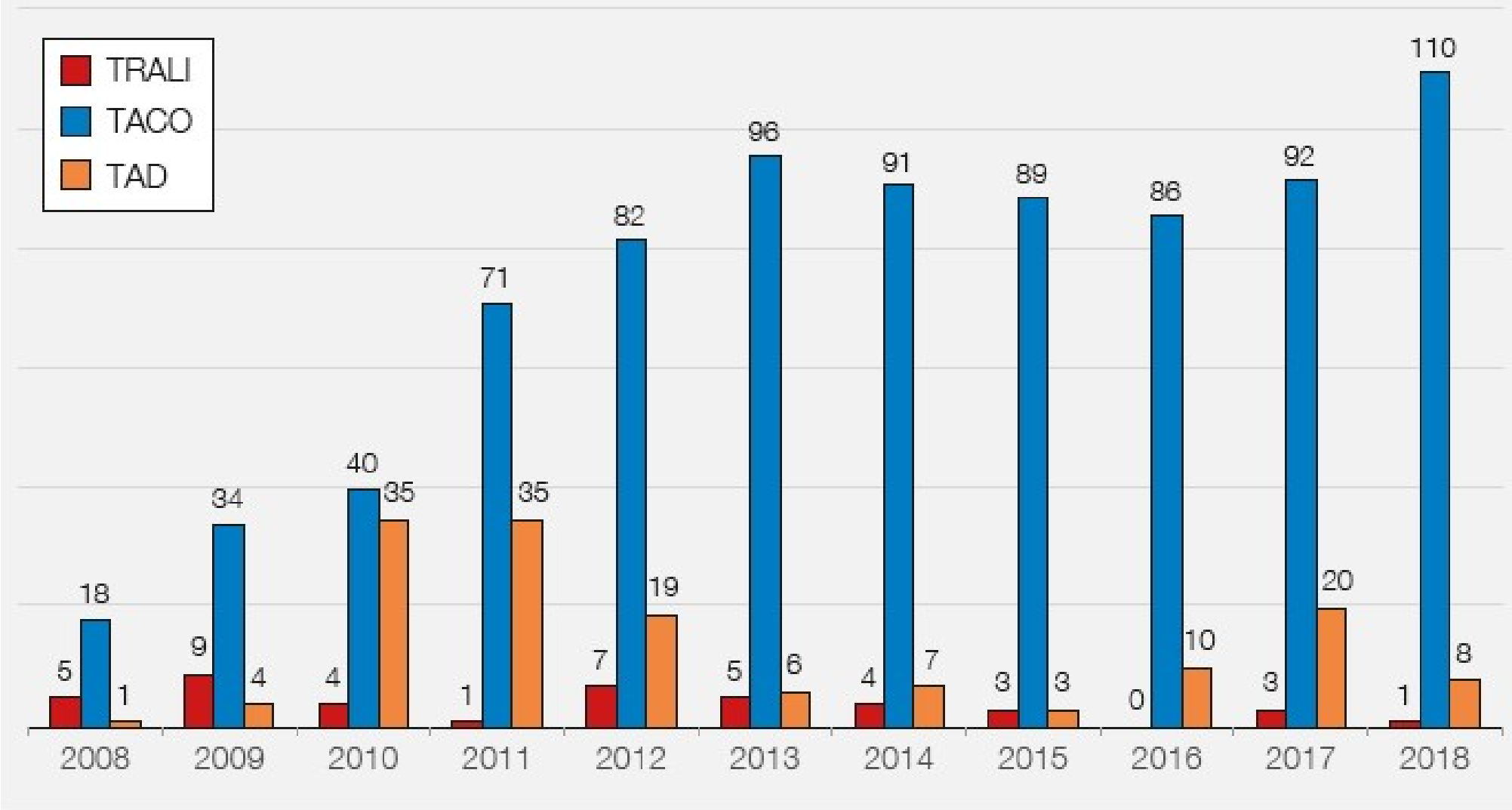
Reactions by component type



HLA=human leucocyte antigen; cryo=cryoprecipitate

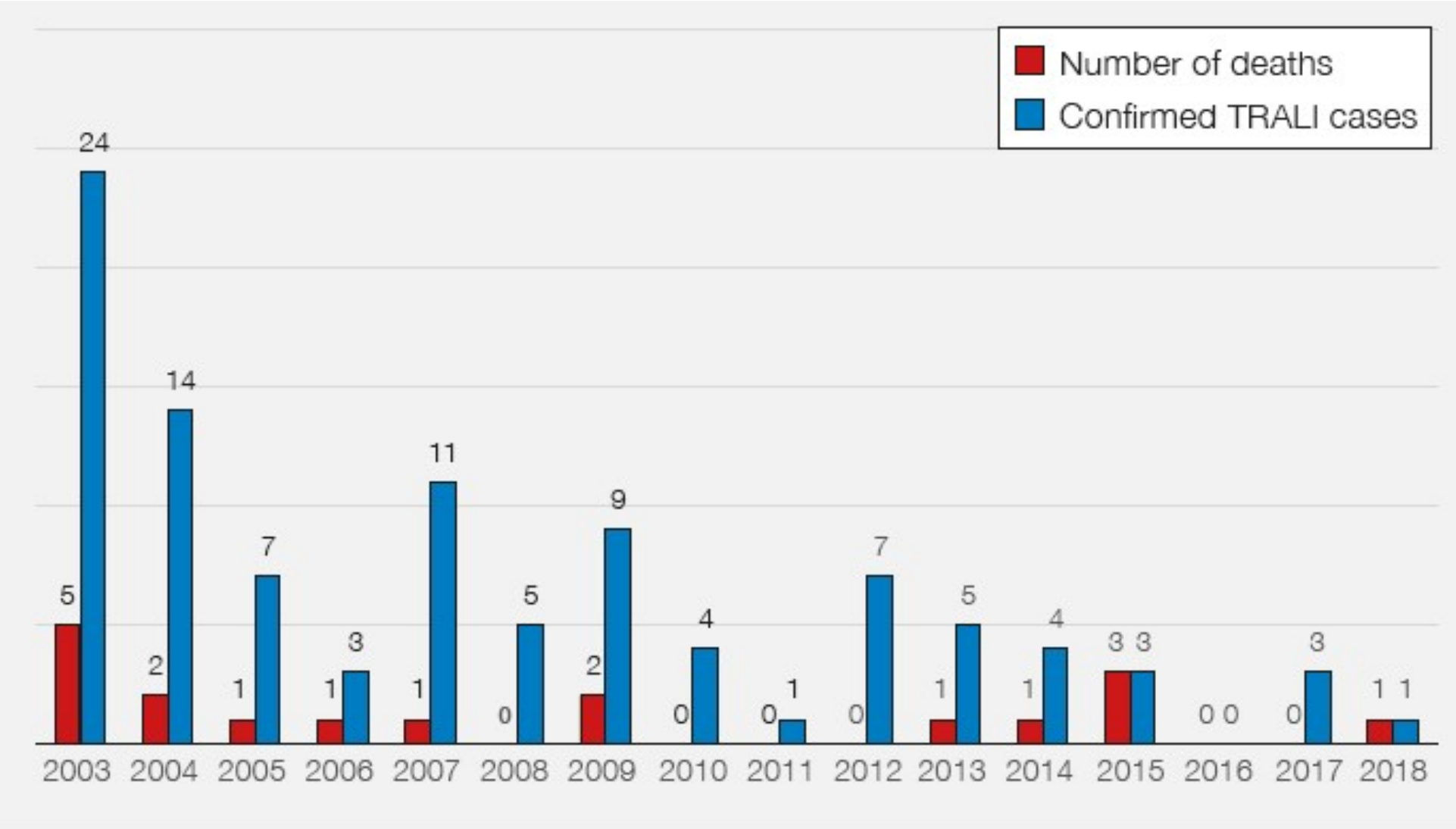
NB: There were no reported febrile, allergic or hypotensive reactions associated with granulocyte transfusion

Reports of pulmonary complications by year 2008-2018



TRALI=transfusion-related acute lung injury; TACO=transfusion-associated circulatory overload; TAD=transfusion-associated dyspnoea

Number of confirmed TRALI cases and deaths at least possibly related to TRALI by year of report



TRALI=transfusion-related acute lung injury

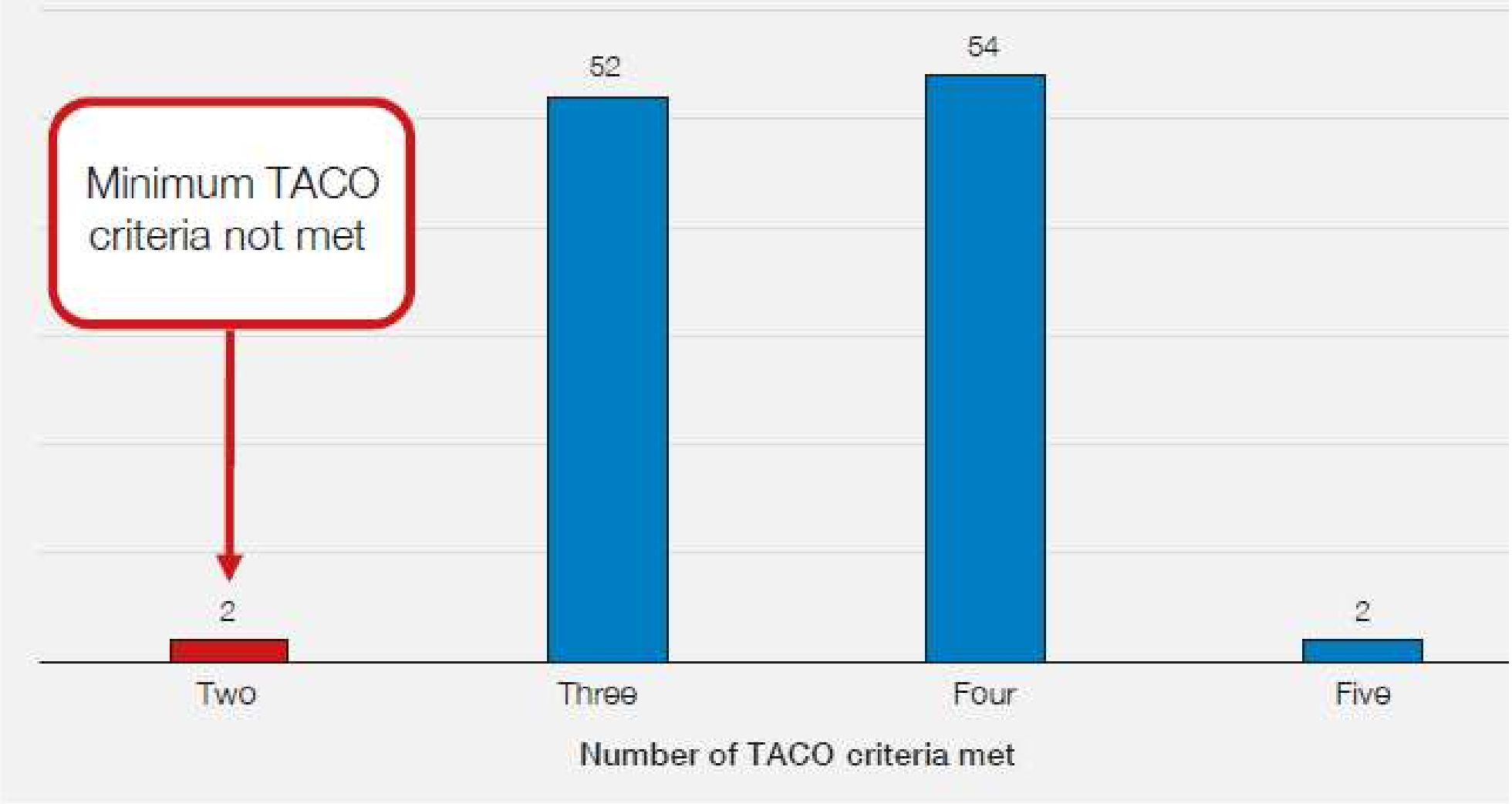
Updated TACO pre-transfusion checklist

TACO Checklist	Red cell transfusion for non-bleeding patients	If 'yes' to any of these questions
	Does the patient have a diagnosis of 'heart failure' congestive cardiac failure (CCF), severe aortic stenosis, or moderate to severe left ventricular dysfunction? Is the patient on a regular diuretic? Does the patient have severe anaemia?	1 • Review the need for transfusion (do the benefits outweigh the risks)?
	Is the patient known to have pulmonary oedema? Does the patient have respiratory symptoms of undiagnosed cause?	2 • Can the transfusion be safely deferred until the issue can be investigated, treated or resolved?
	Is the fluid balance clinically significantly positive? Is the patient on concomitant fluids (or has been in the past 24 hours)? Is there any peripheral oedema? Does the patient have hypoalbuminaemia? Does the patient have significant renal impairment?	3 • Consider body weight dosing for red cells (especially if low body weight) • Transfuse one unit (red cells) and review symptoms of anaemia • Measure the fluid balance • Consider giving a prophylactic diuretic • Monitor the vital signs closely, including oxygen saturation

Due to the differences in adult and neonatal physiology, babies may have a different risk for TACO. Calculate the dose by weight and observe the notes above.

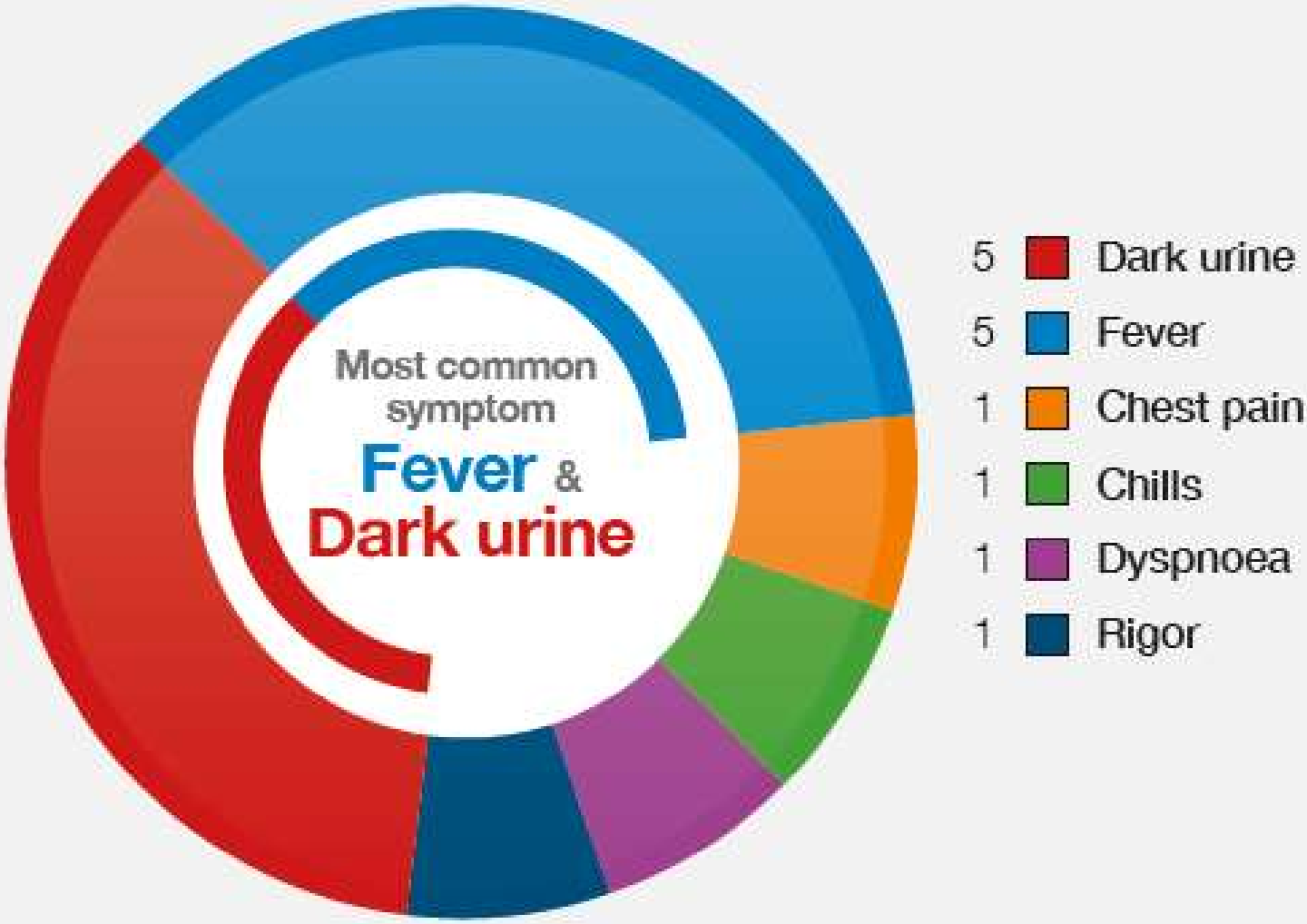
TACO=transfusion-associated circulatory overload

Analysis of reports by the revised surveillance diagnosis criteria (number of criteria versus number of accepted cases)

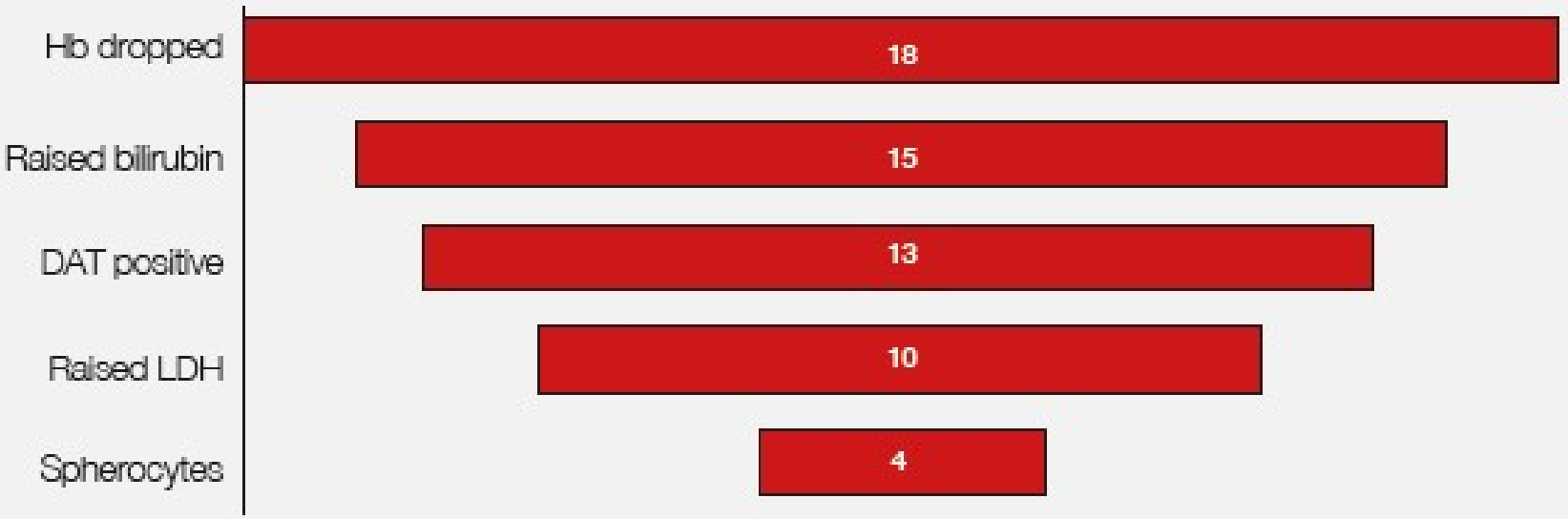


TACO=transfusion-associated circulatory overload

Clinical symptoms associated with DHTR

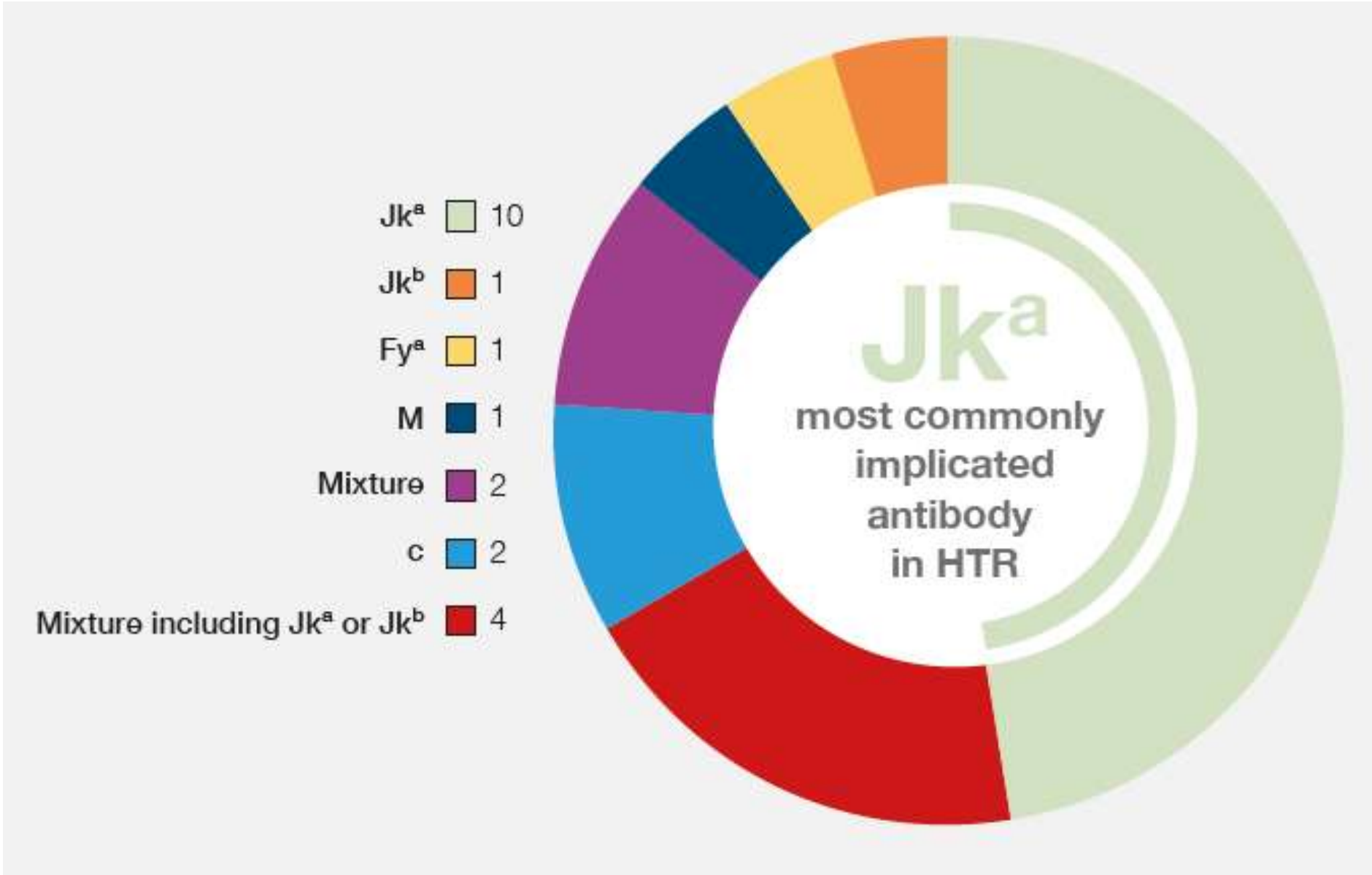


Laboratory indications detected in DHTR

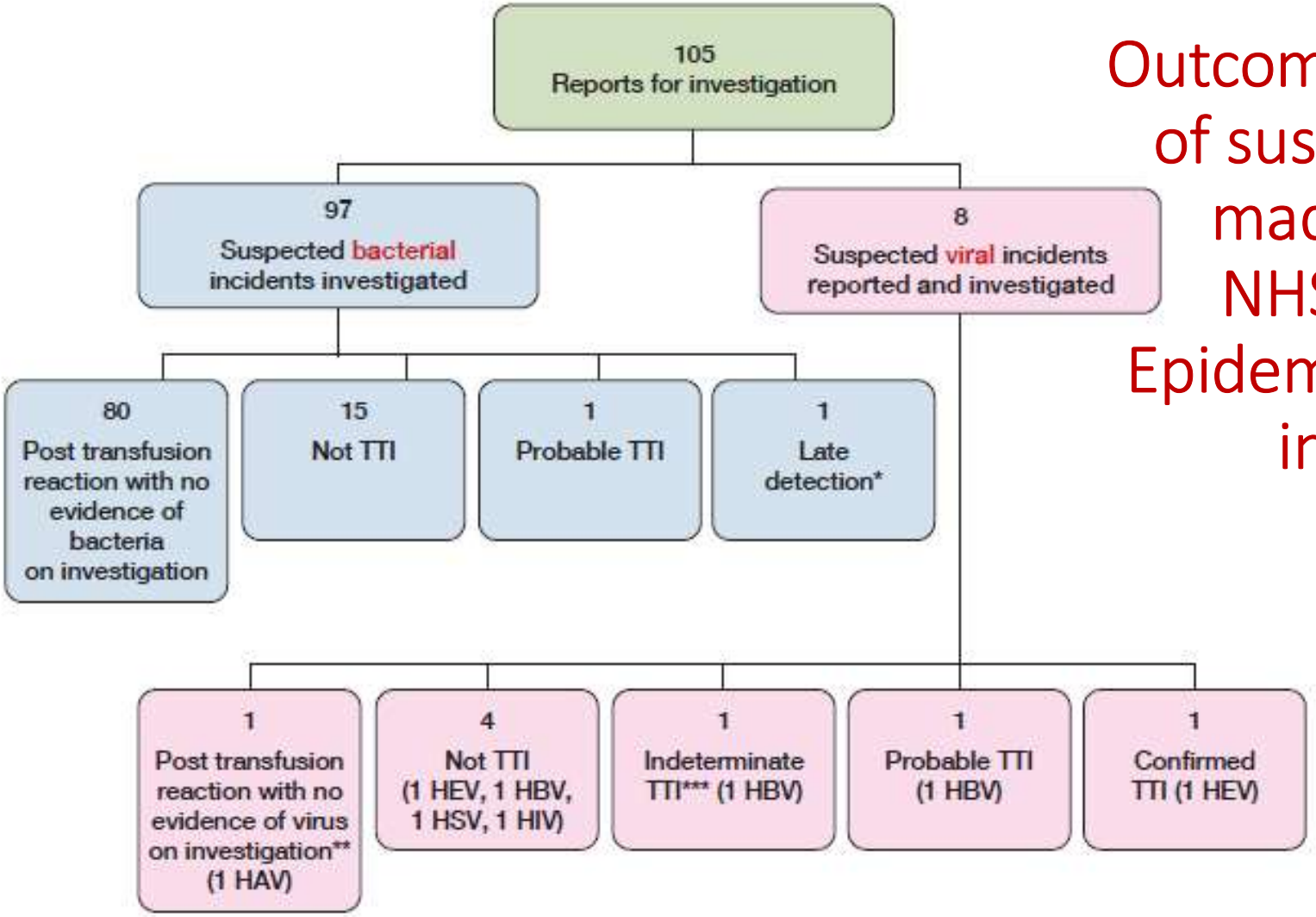


DAT=direct antiglobulin test; Hb=haemoglobin; LDH=lactate dehydrogenase

Antibodies implicated in delayed haemolytic transfusion reactions (DHTR)



Outcome of reports of suspected TTI made to the NHSBT/PHE Epidemiology Unit in 2018



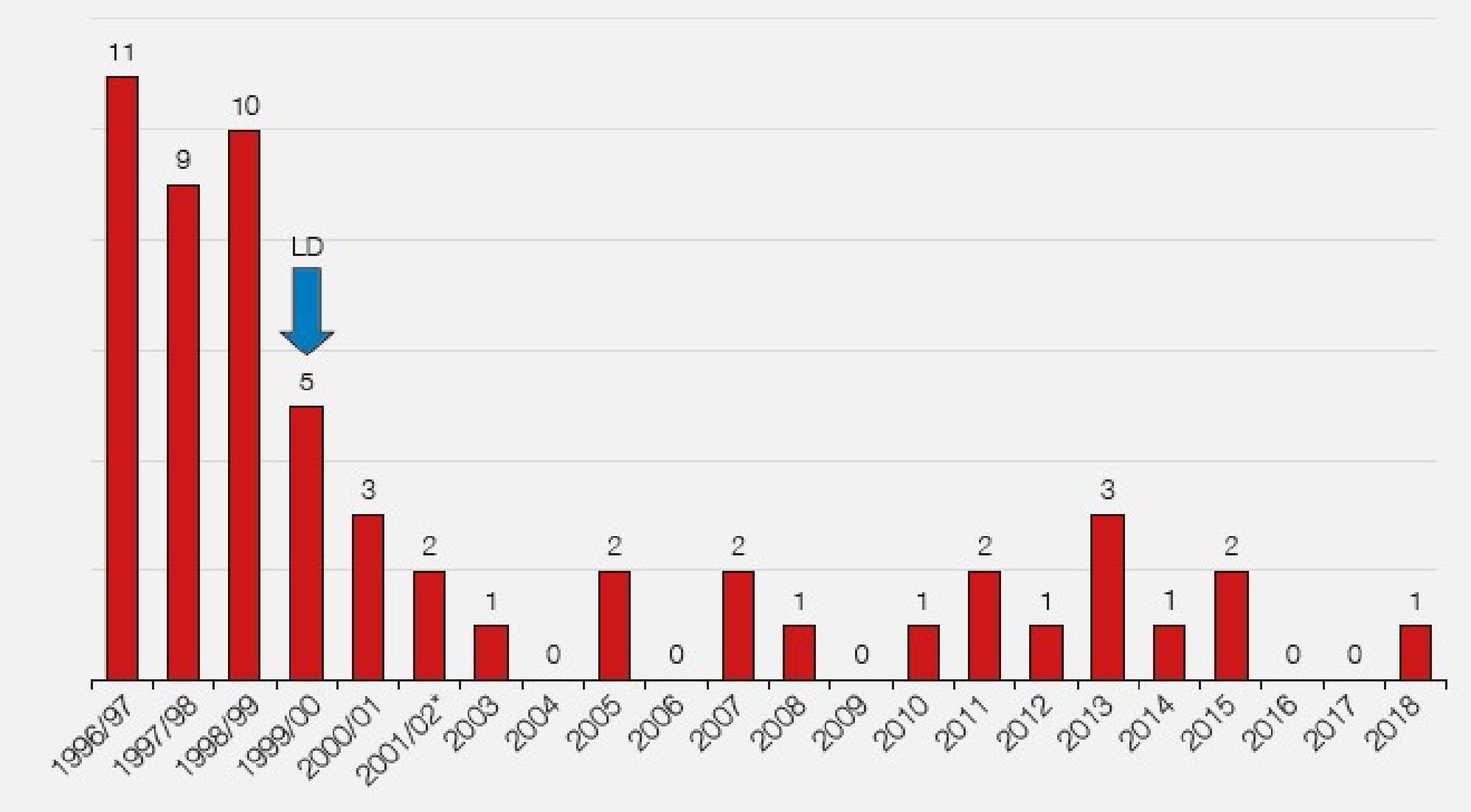
TTI=transfusion-transmitted infection; HAV=hepatitis A virus; HBV=hepatitis B virus; HSV=herpes simplex virus; HIV=human immunodeficiency virus; HEV=hepatitis E virus

**The BacT/ALERT system flagged as positive after the associated platelets had been issued and transfused however no evidence of a TTI was found*

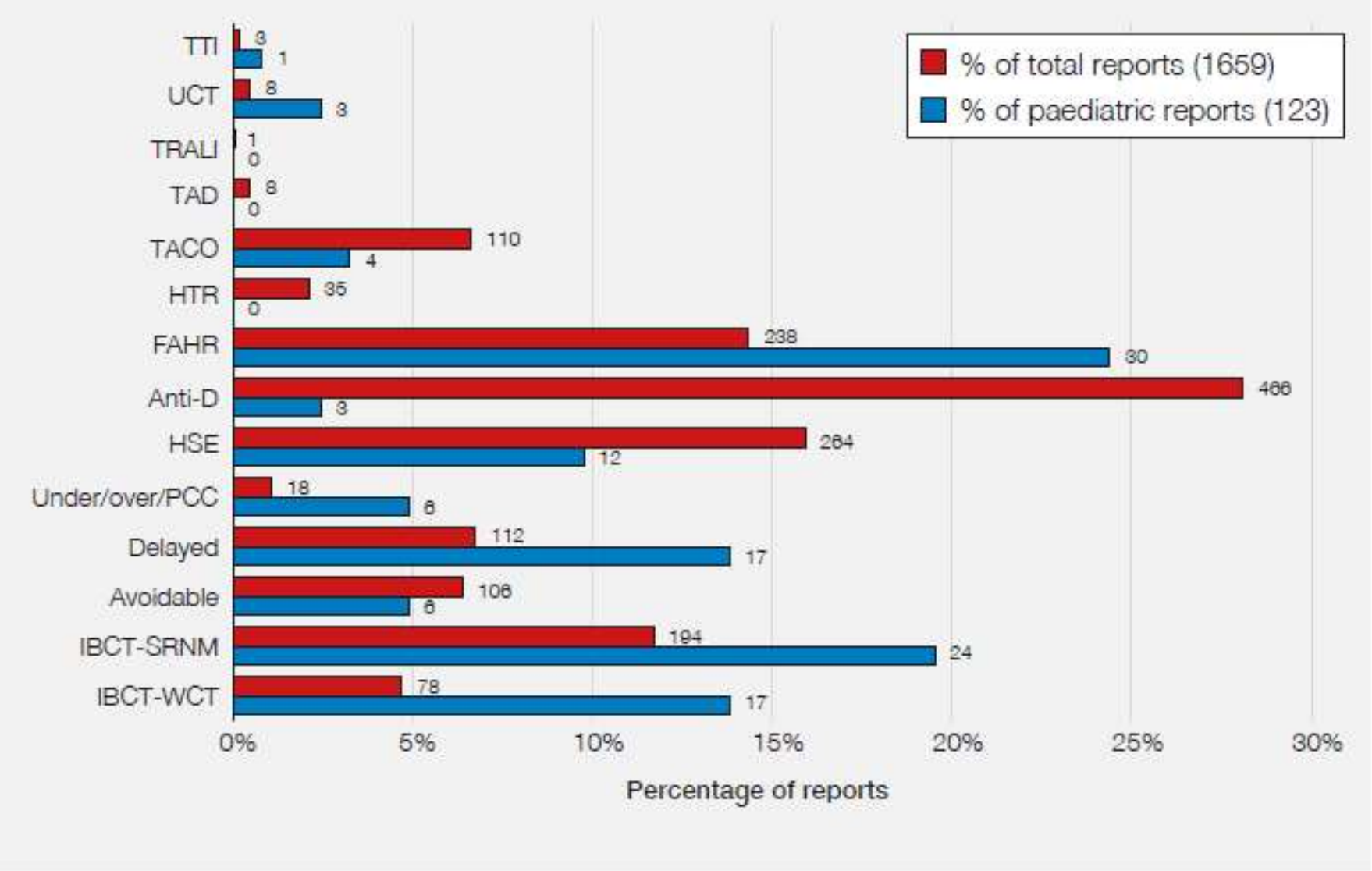
***Reported based on a clinical diagnosis of HAV, but this was not confirmed by further laboratory testing*

****Due to the time elapsed since transfusion archive samples were not available for half of the implicated donations*

The number of cases of PTP with confirmed HPA alloantibodies reported annually to SHOT since 1996, a total of 57 reports. Cumulative data 1996 to 2018

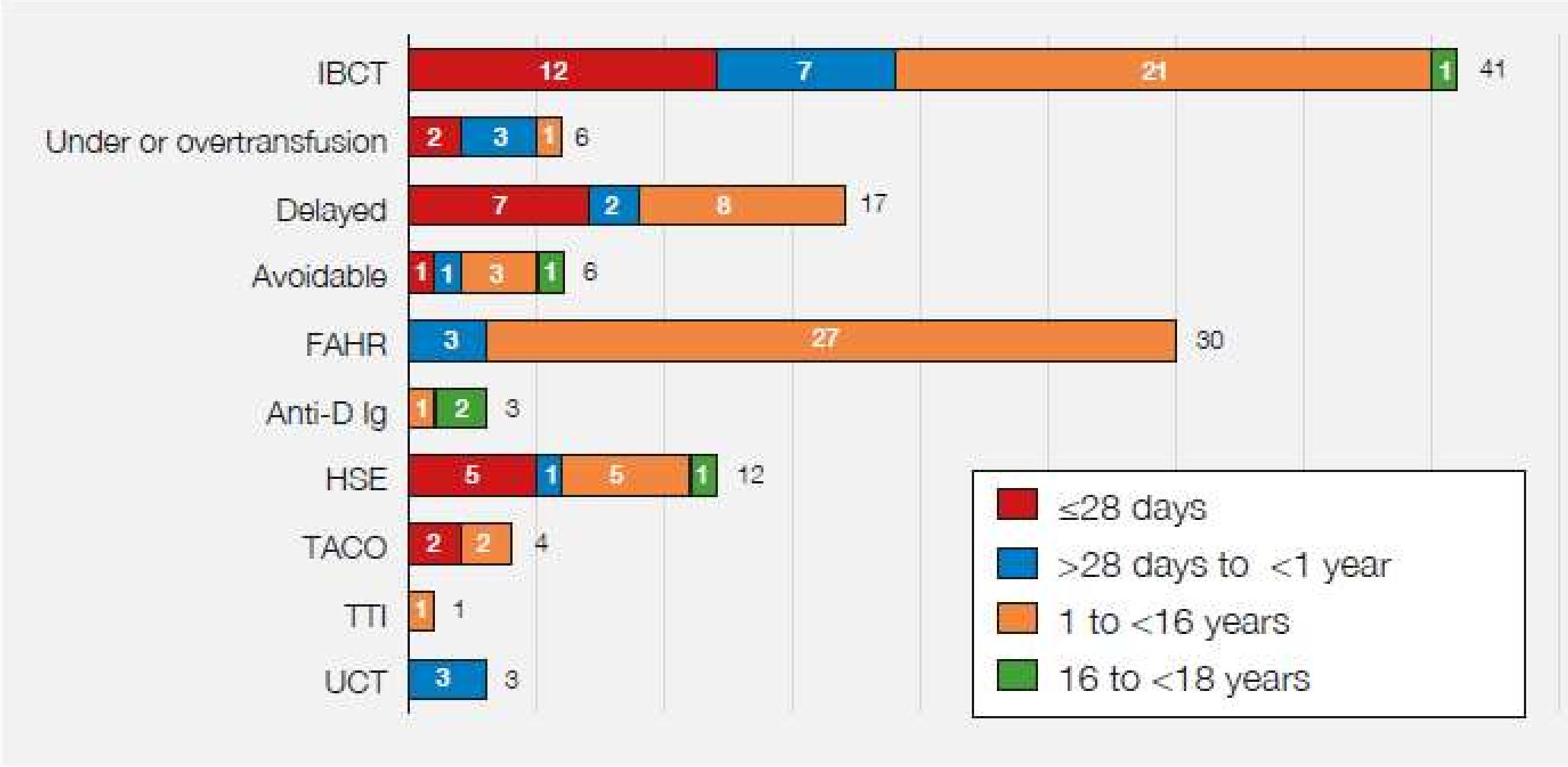


Percentages of paediatric and total reports in each category



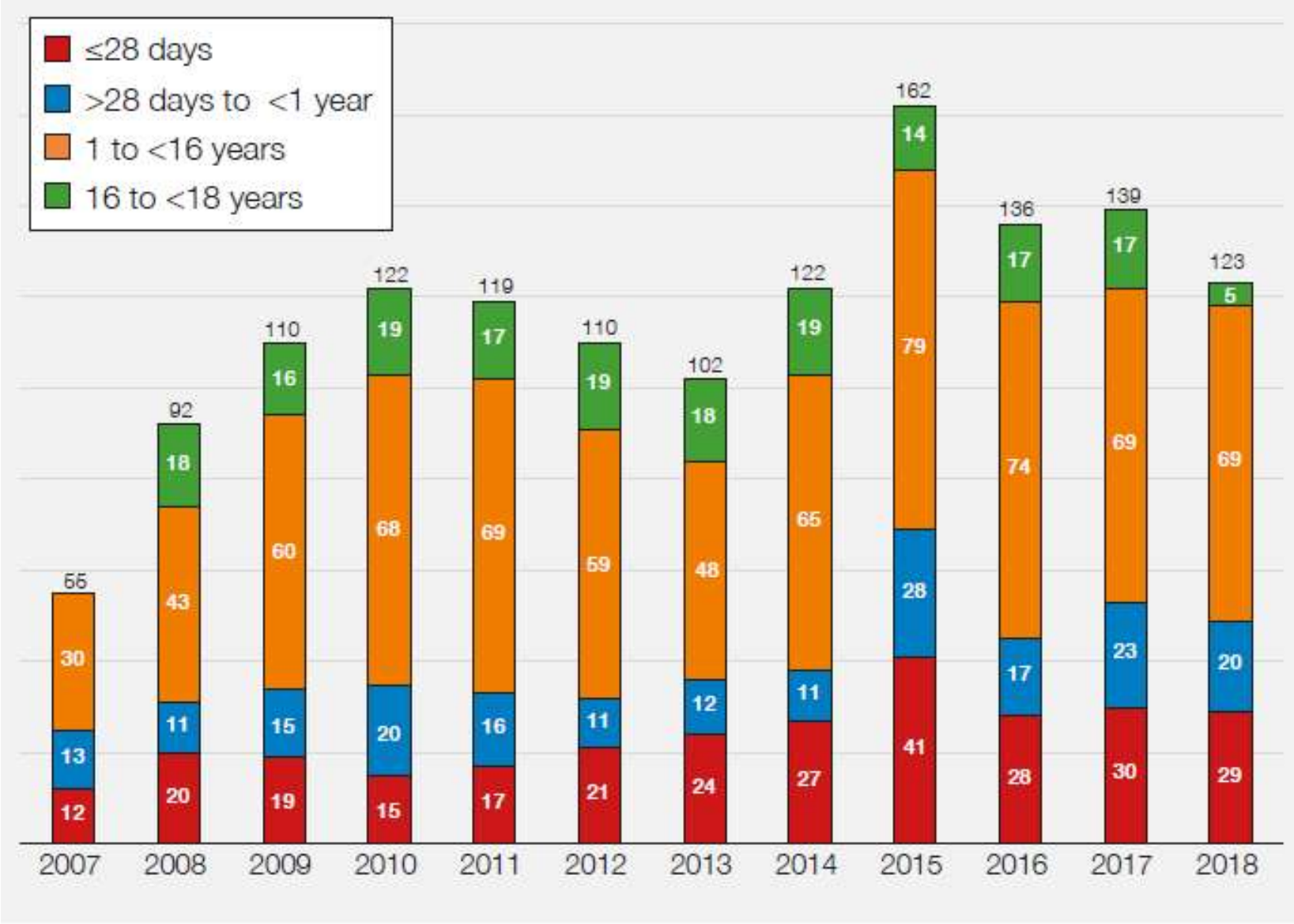
TTI=transfusion-transmitted infection; UCT=unclassifiable complications of transfusion; TRALI=transfusion-related acute lung injury; TAD=transfusion-associated dyspnoea; TACO=transfusion-associated circulatory overload; HTR=haemolytic transfusion reactions; FAHR=febrile, allergic and hypotensive reactions; HSE=handling and storage errors; IBCT-SRNM=incorrect blood component transfused-specific requirements not met; IBCT-WCT=IBCT-wrong component transfusion

Summary of paediatric reports by category and age for 2018



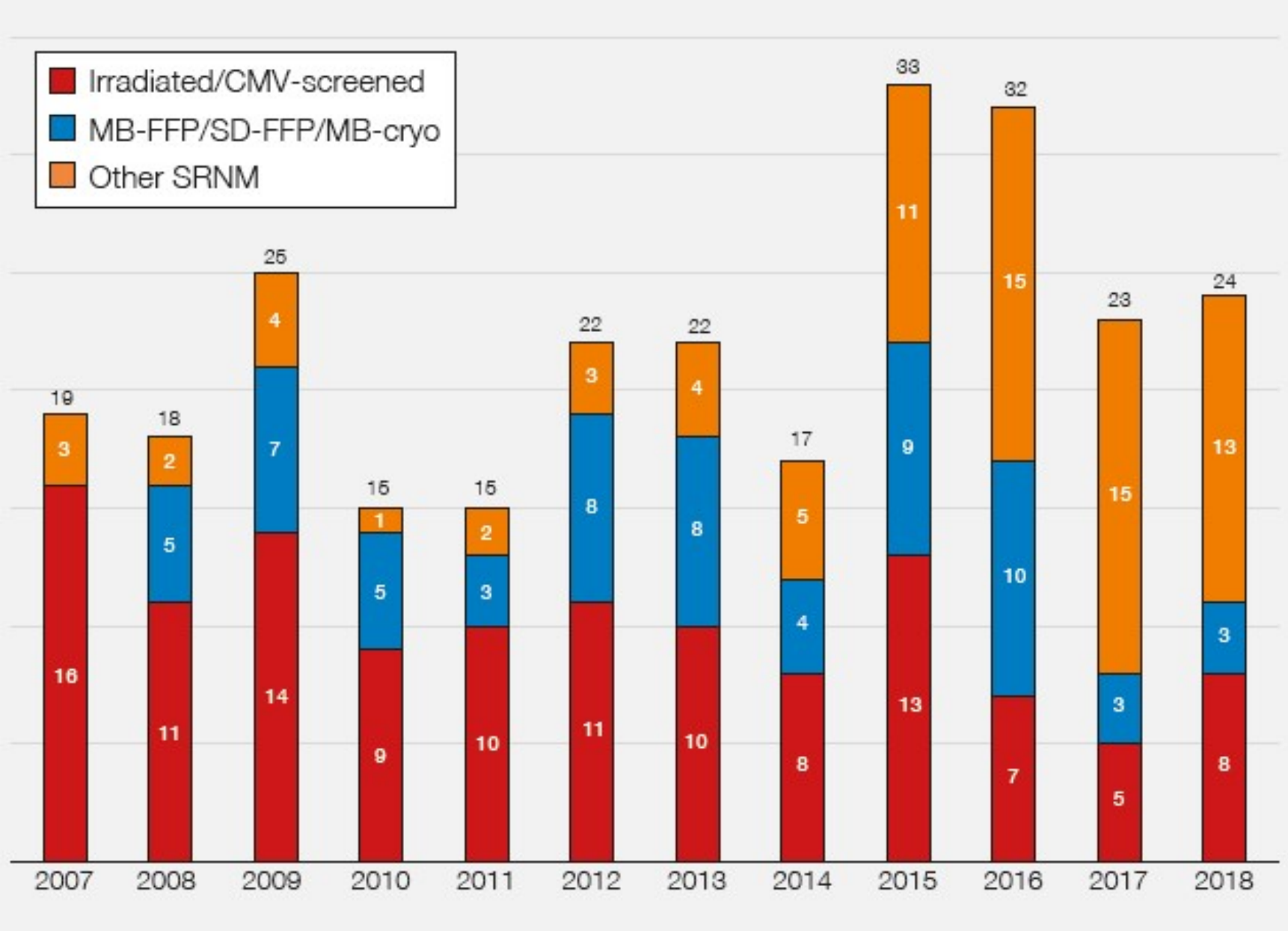
IBCT=incorrect blood component transfused; FAHR=febrile, allergic and hypotensive reactions; HSE=handling and storage errors; TACO=transfusion-associated circulatory overload; TTI=transfusion-transmitted infection; UCT=unclassifiable complications of transfusion

Trends in paediatric reports 2007-2018
Total paediatric reports subdivided by age

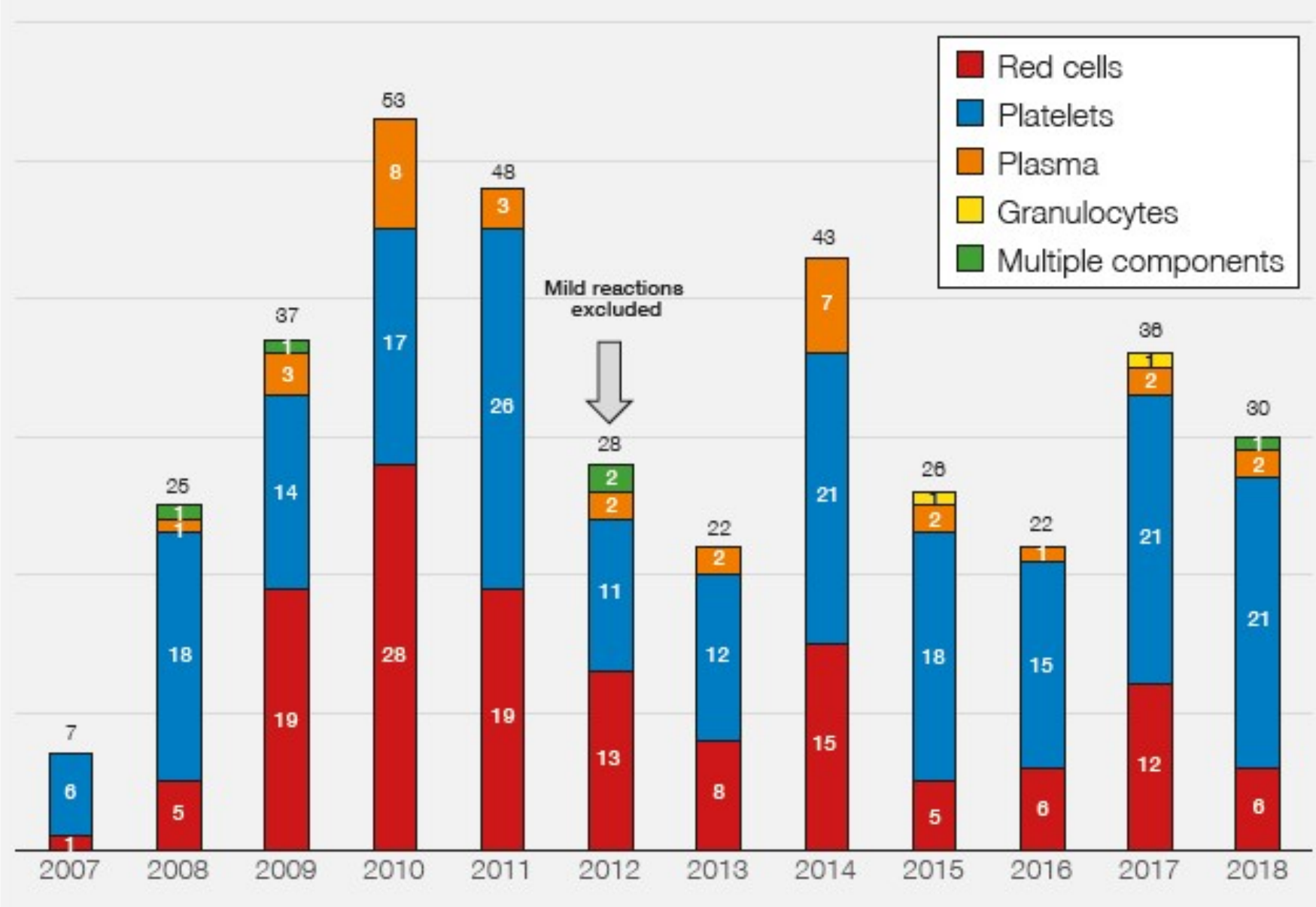


In 2007 only cases <16 years were included

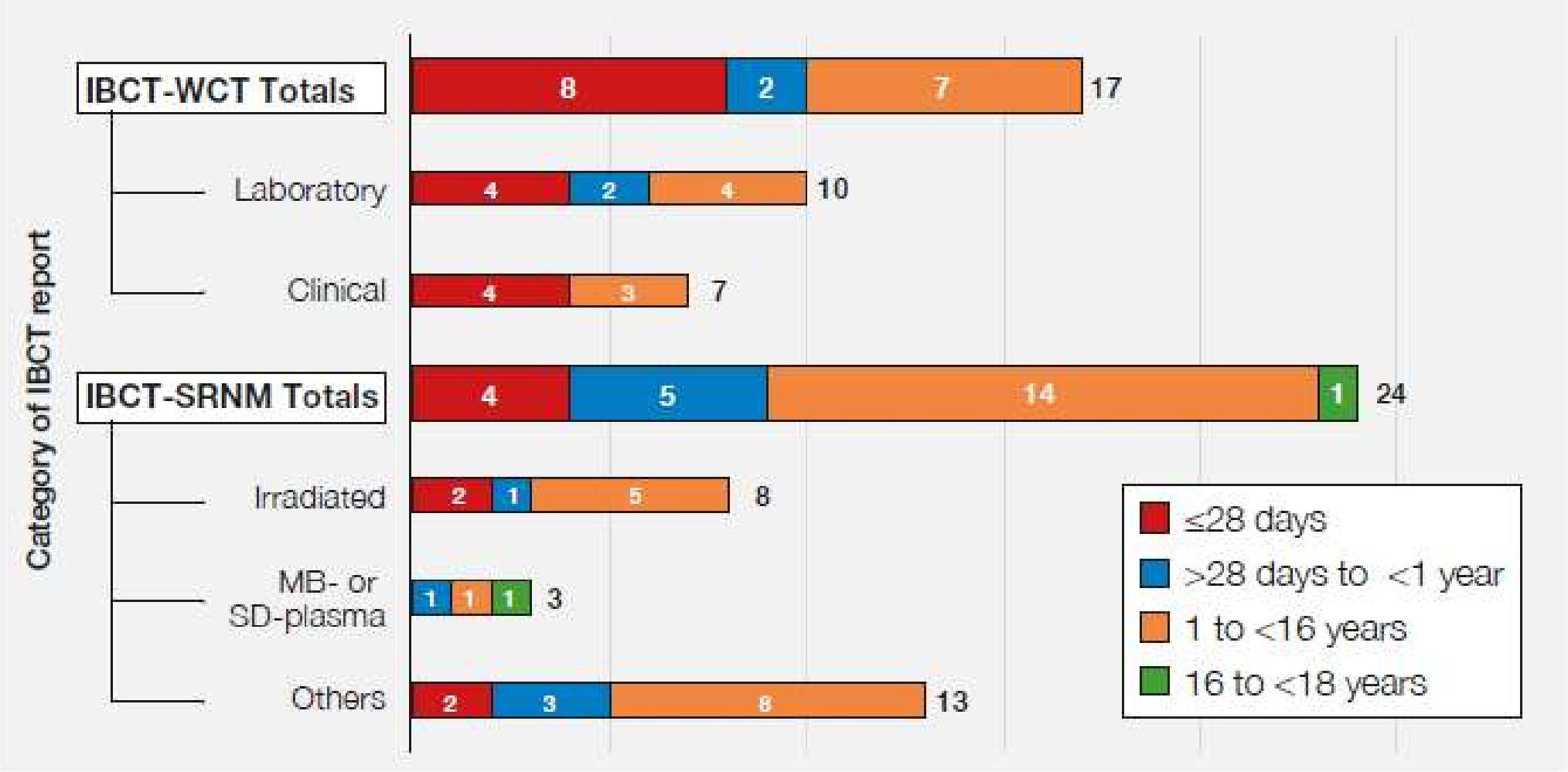
Trends in paediatric reports 2007-2018
Specific requirements were not met (SRNM)



Trends in paediatric reports 2007-2018
Febrile, allergic and hypotensive reactions by component type

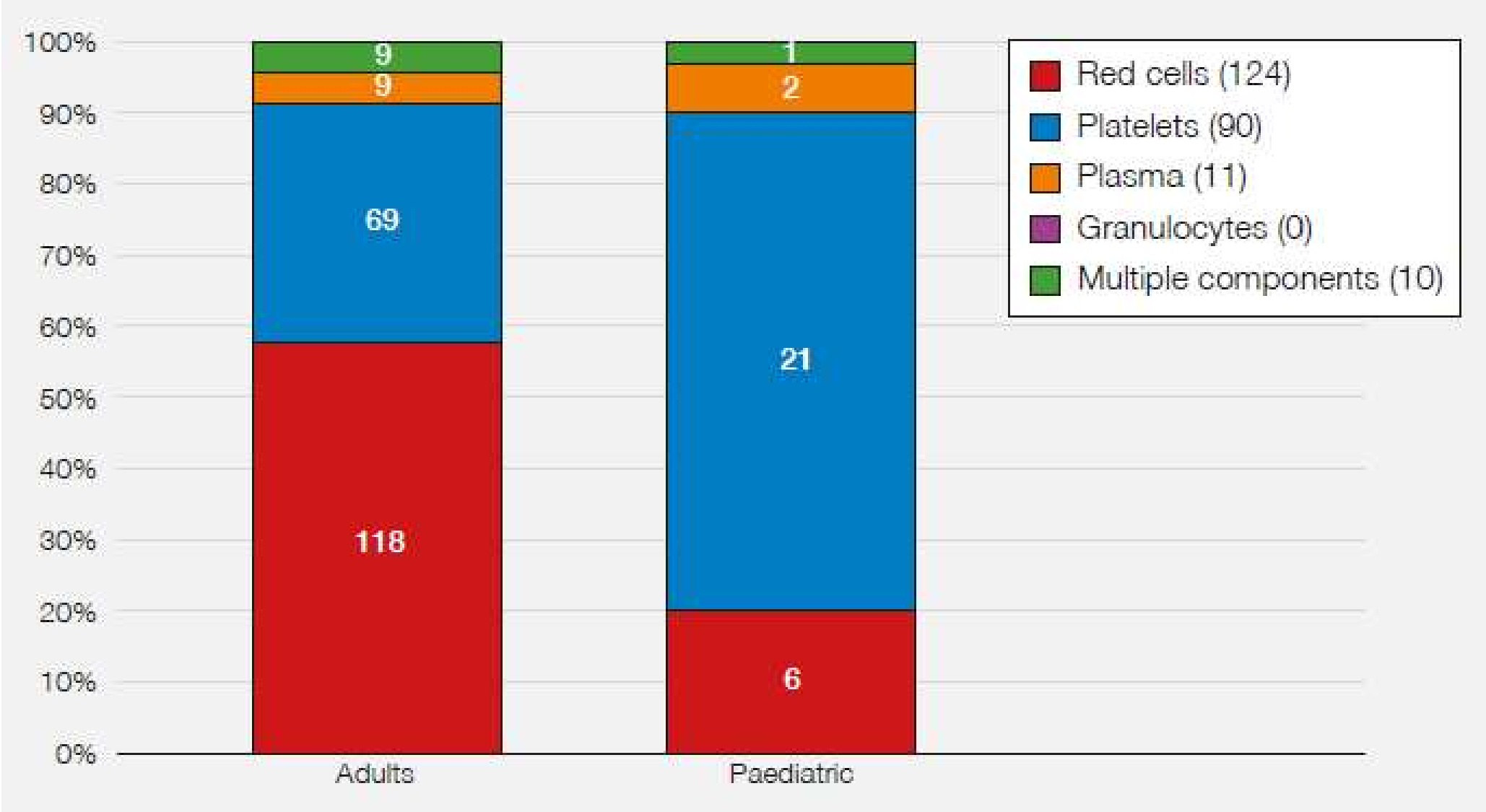


Breakdown of incorrect blood component transfused reports

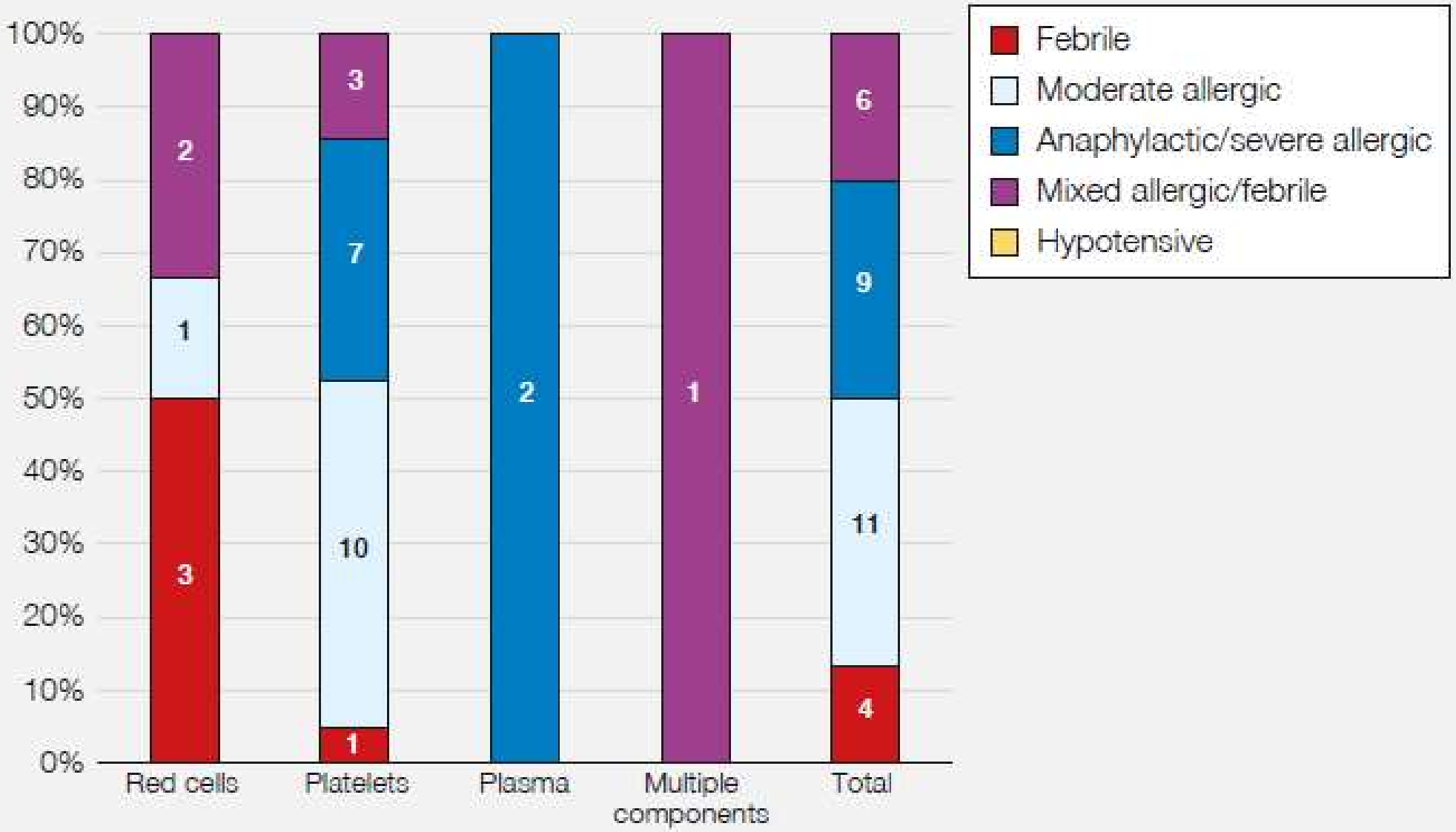


IBCT-WCT=incorrect blood component transfused-wrong component transfused; IBCT-SRNM=IBCT-specific requirements not met; MB=methylene blue-treated; SD=solvent-detergent treated

Comparison of proportions of adult and paediatric febrile, allergic or hypotensive reactions (FAHR) related to different components

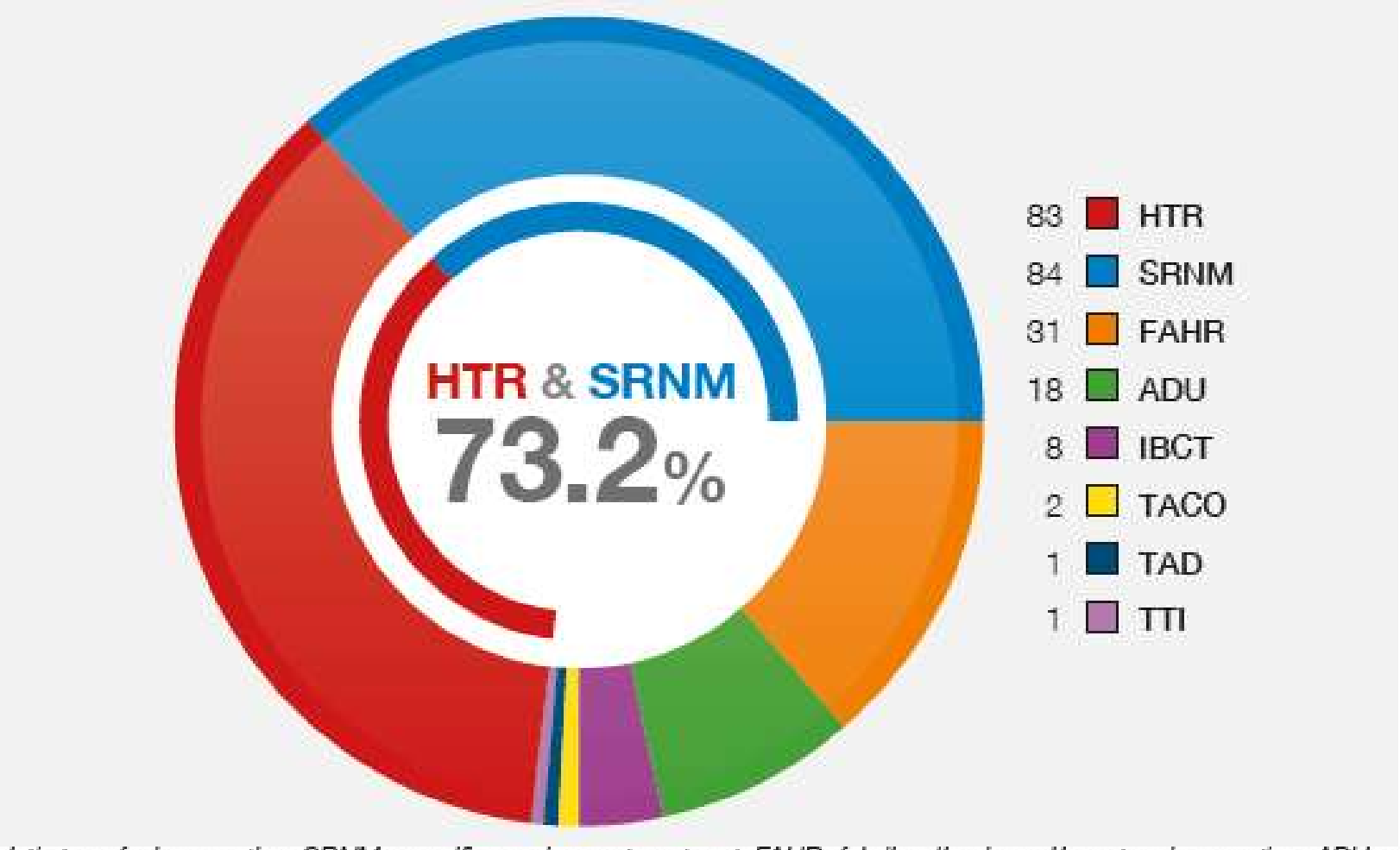


Percentages of reaction types for each component for paediatric reports



Cumulative data for adverse events in transfusion for patients with haemoglobin disorders 2010 to 2018

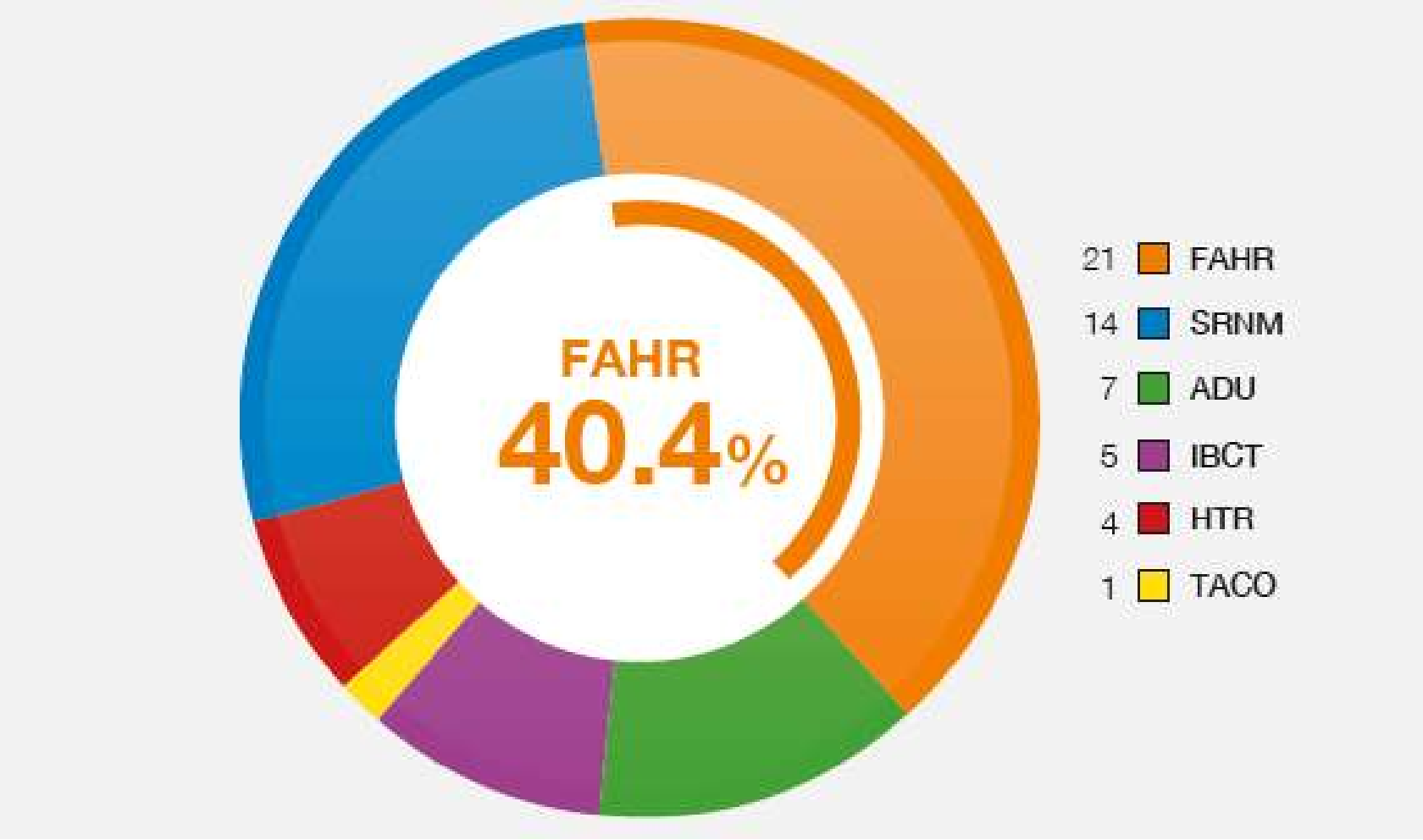
Sickle cell disease n=228



HTR=haemolytic transfusion reaction; SRNM=specific requirements not met; FAHR=febrile, allergic and hypotensive reaction; ADU=avoidable, delayed and under or overtransfusion; IBCT=incorrect blood component transfused; TACO=transfusion-associated circulatory overload; TAD=transfusion-associated dyspnoea; TTI=transfusion-transmitted infection

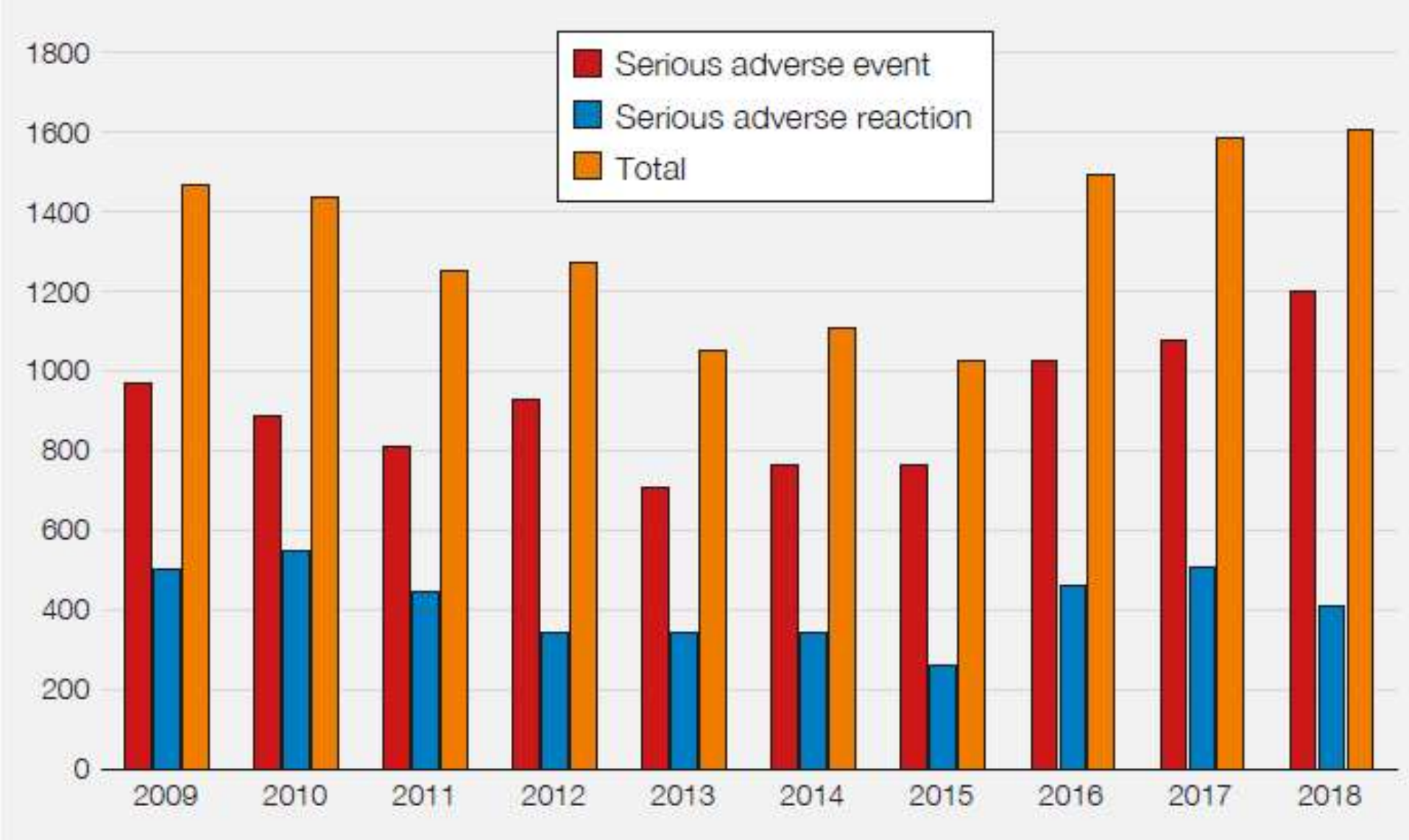
Cumulative data for adverse events in transfusion for patients with haemoglobin disorders 2010 to 2018

Thalassaemia n=52

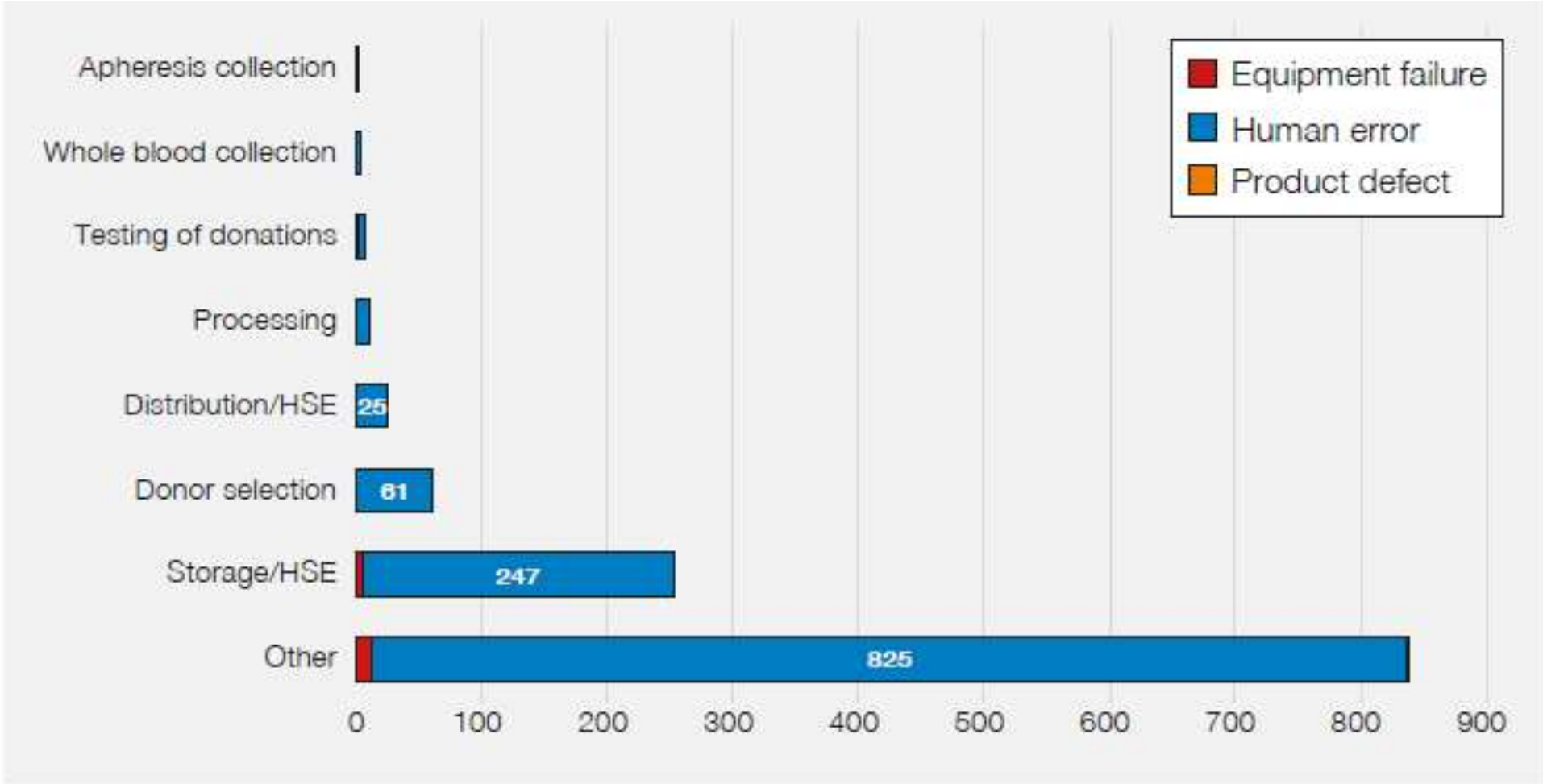


HTR=haemolytic transfusion reaction; SRNM=specific requirements not met; FAHR=febrile, allergic and hypotensive reaction; ADU=avoidable, delayed and under or overtransfusion; IBCT=incorrect blood component transfused; TACO=transfusion-associated circulatory overload;

Submitted SABRE confirmation reports 2009-2018



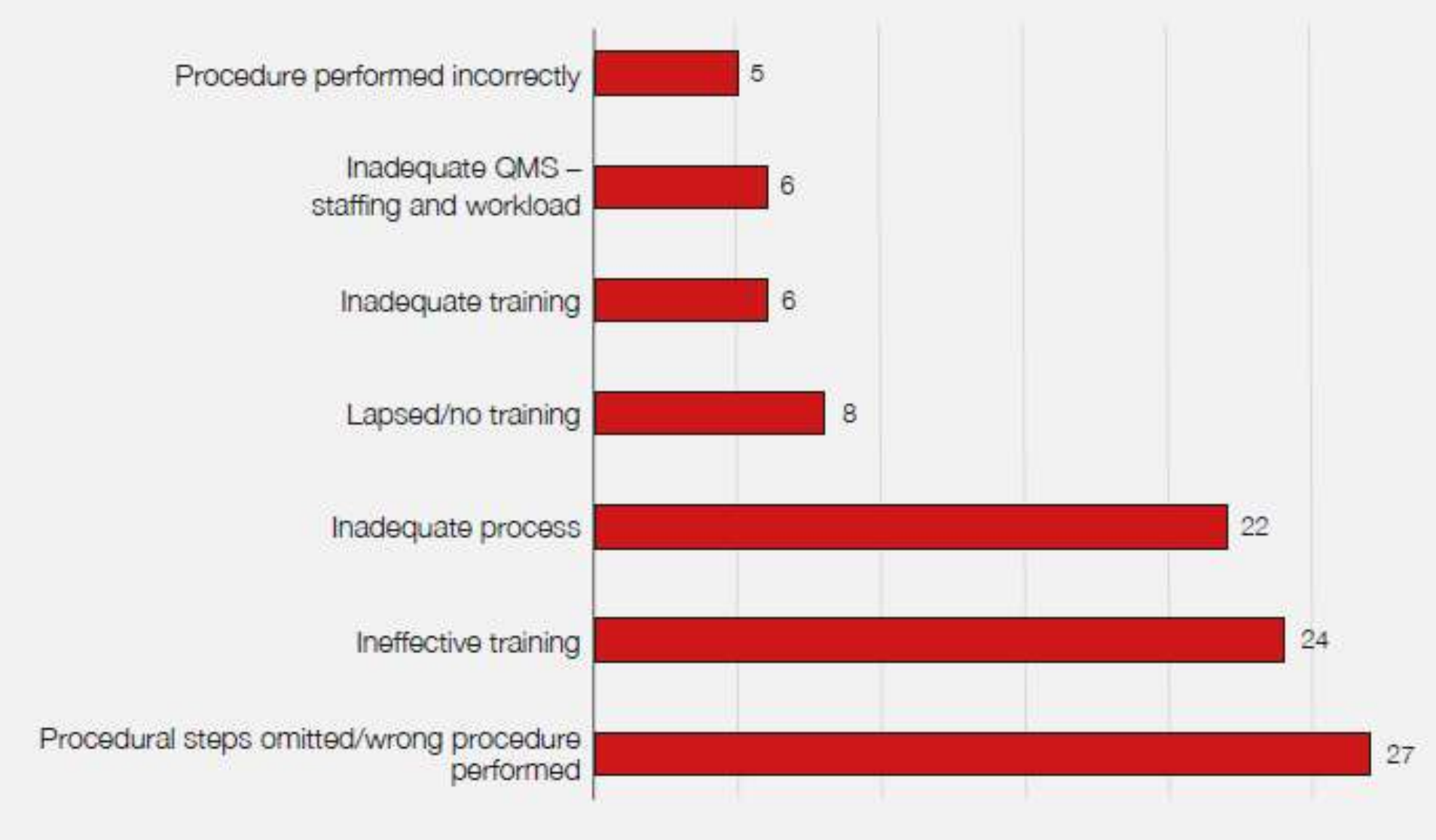
2018 serious adverse event (SAE) confirmation reports by deviation and specification



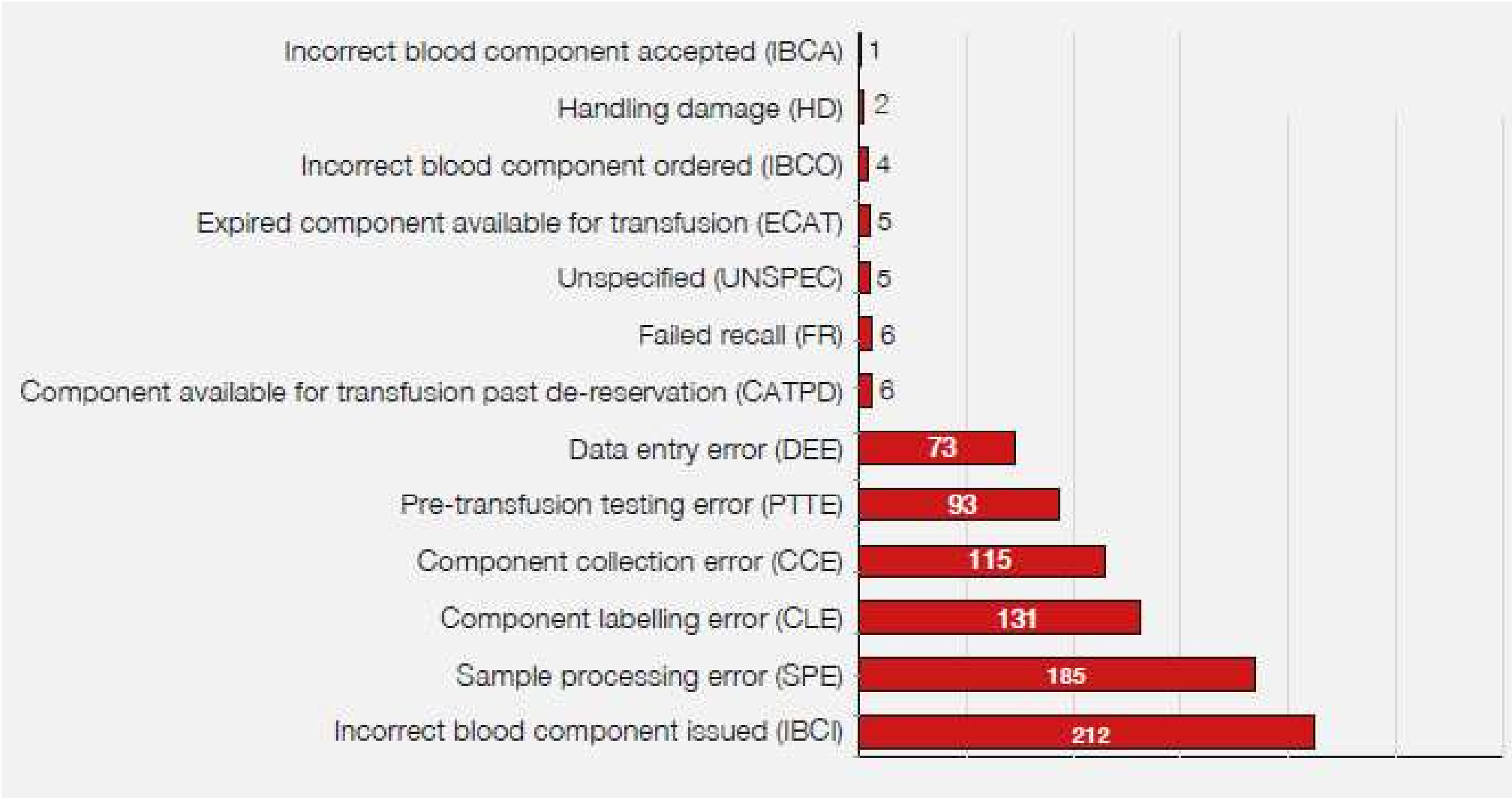
HSE=handling and storage errors

Numbers too small to be annotated on the figure: Apheresis collection: Human error=1, Whole blood collection: Human error=4, Testing of donations: Equipment failure=1; human error=5, Processing: Human error=10; product defect=1, Storage/HSE: Equipment failure=5, Other: Equipment failure=12; product defect=1

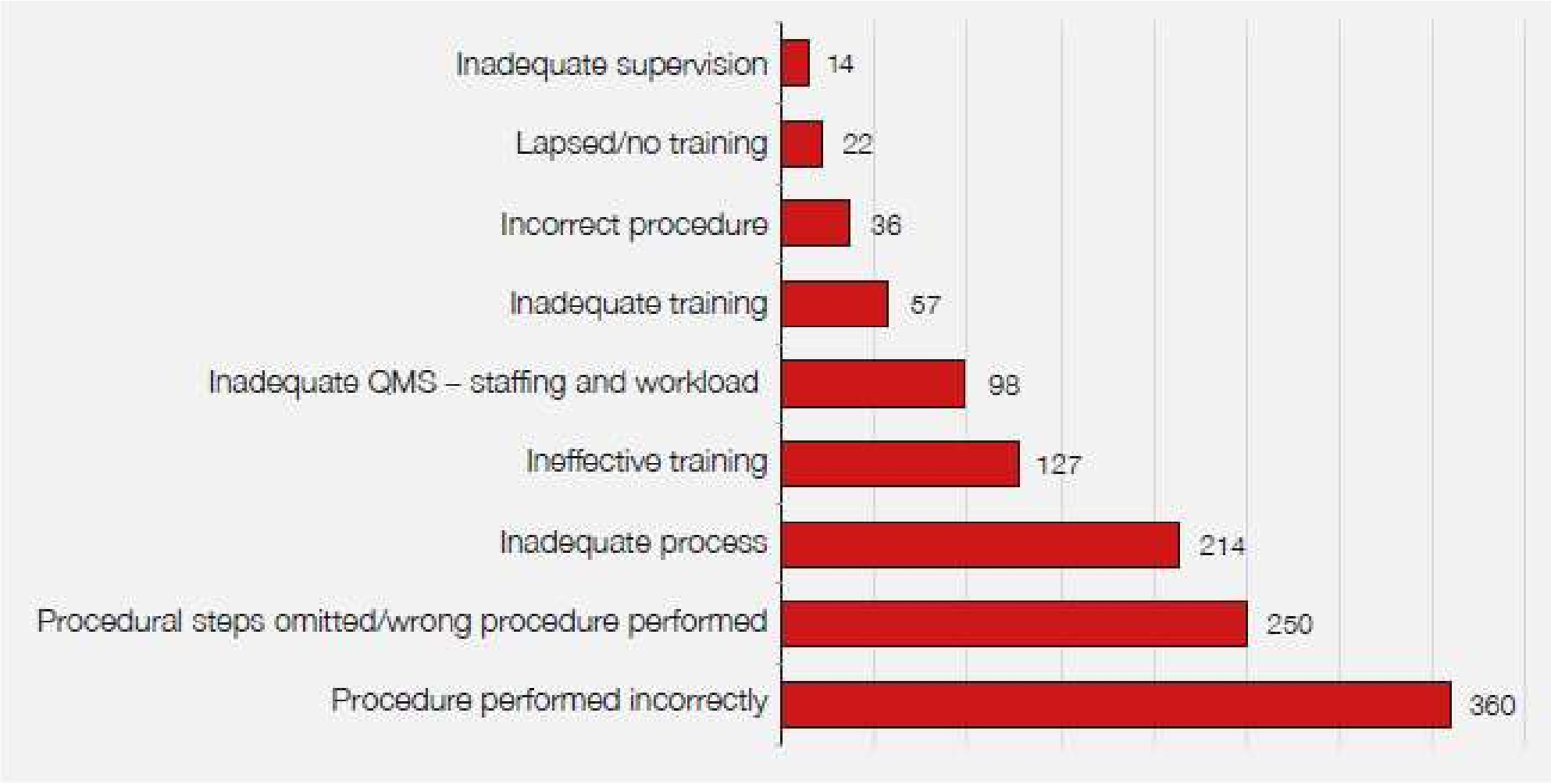
Incorrect storage of component by specification 2018



SABRE reports, subcategory ‘other’, 2018

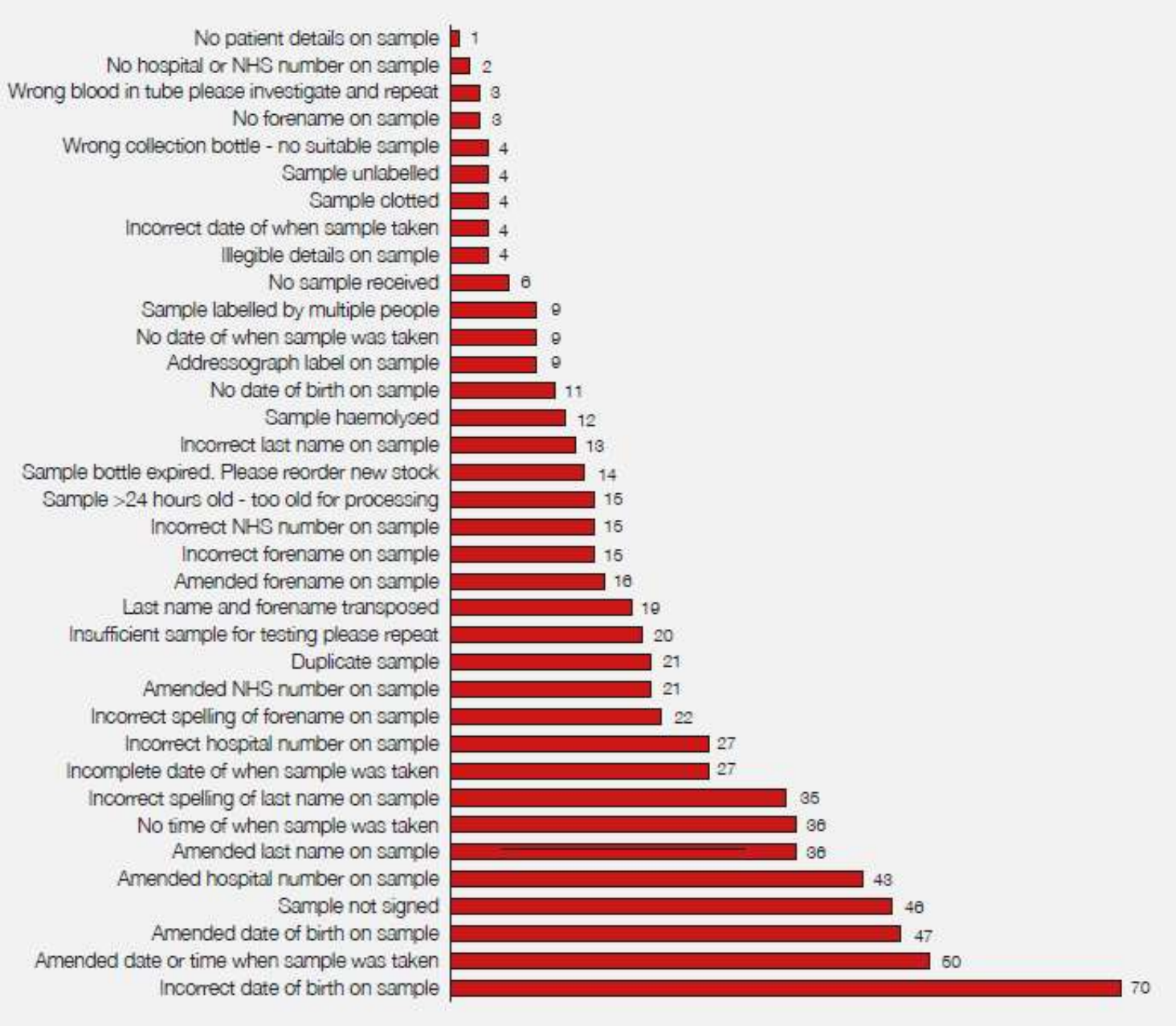


SABRE reports, human error subcategory, 2018

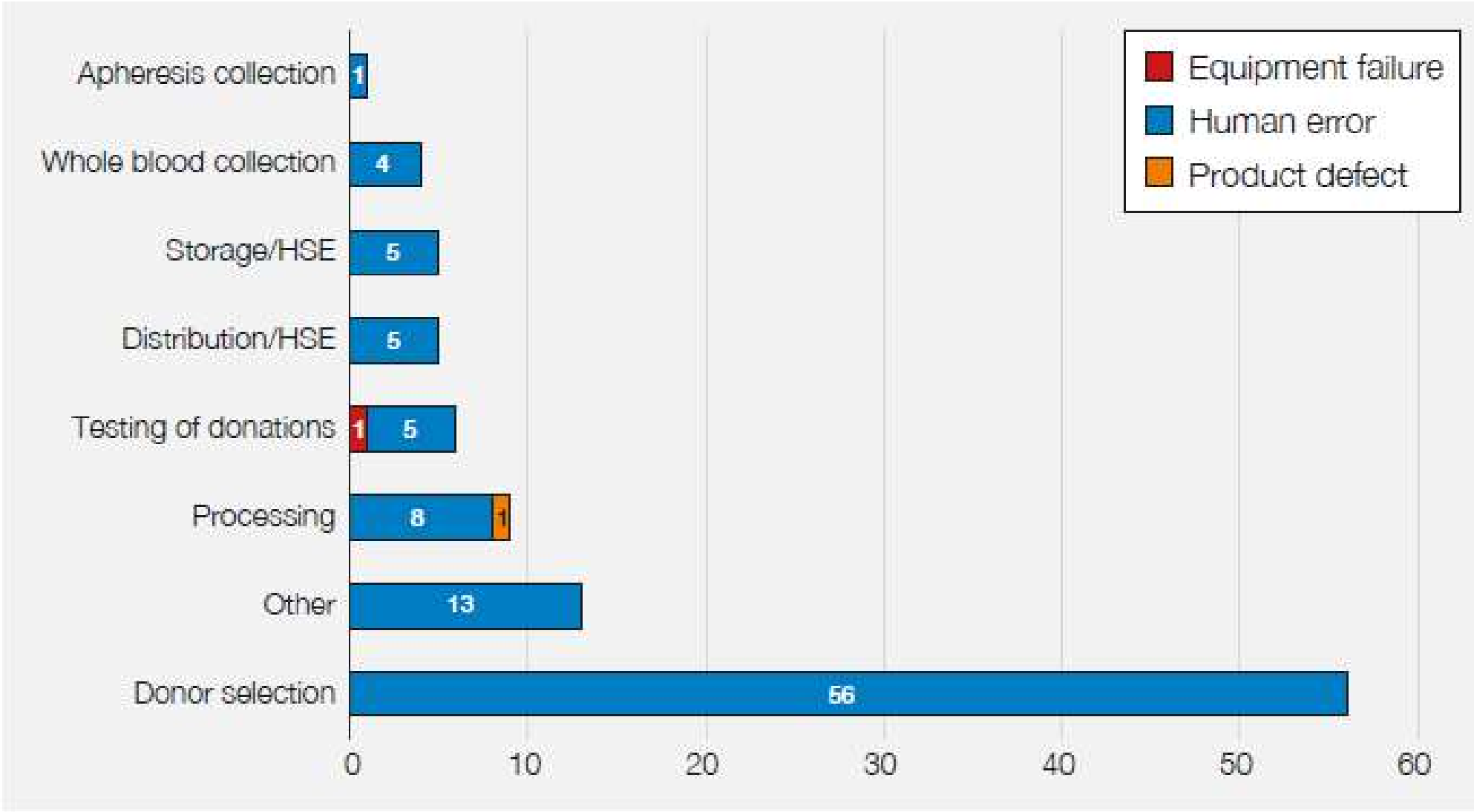


QMS=quality management system

Reasons for rejected samples from blood transfusion

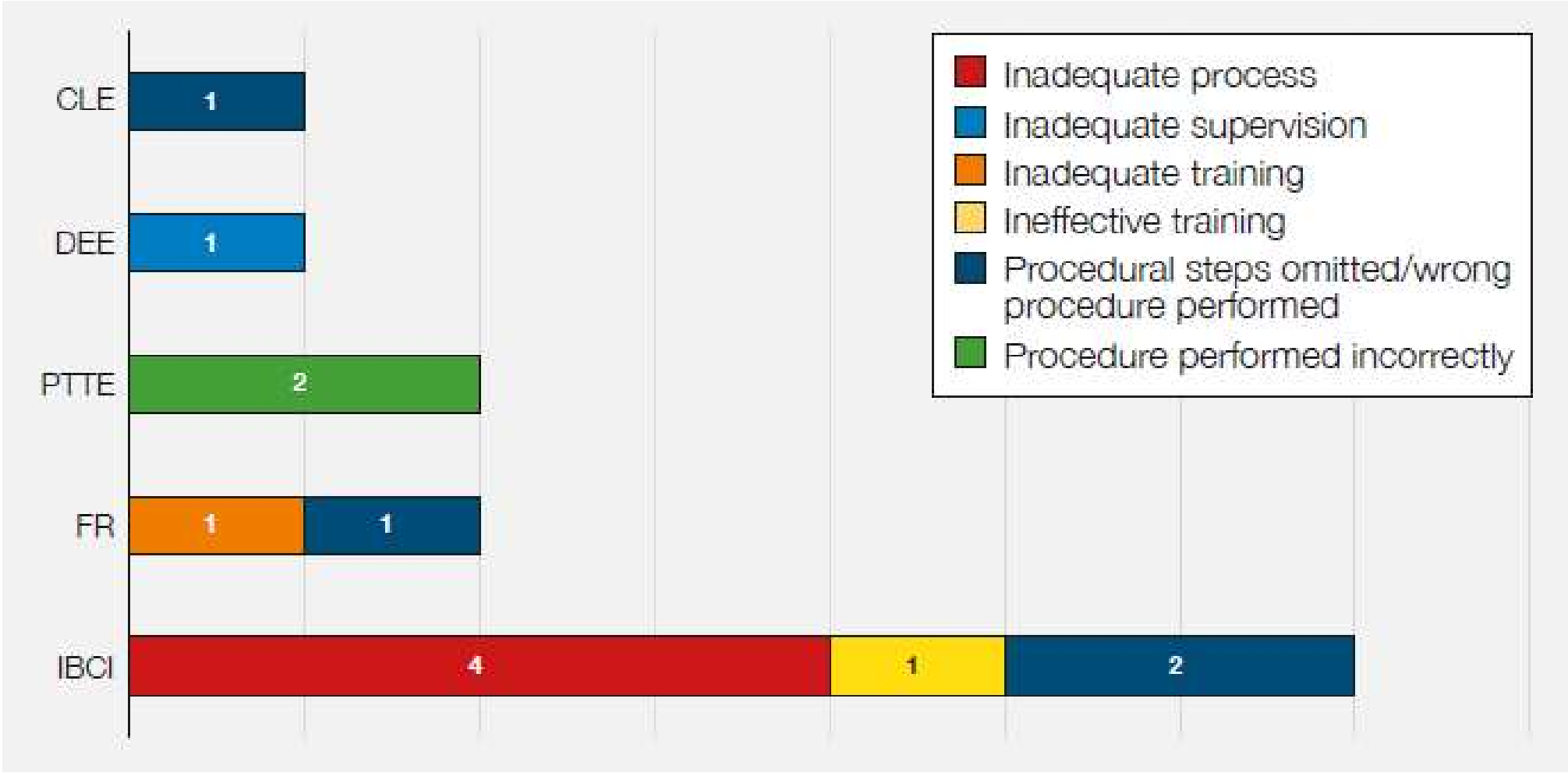


Blood establishment SAE category by specification

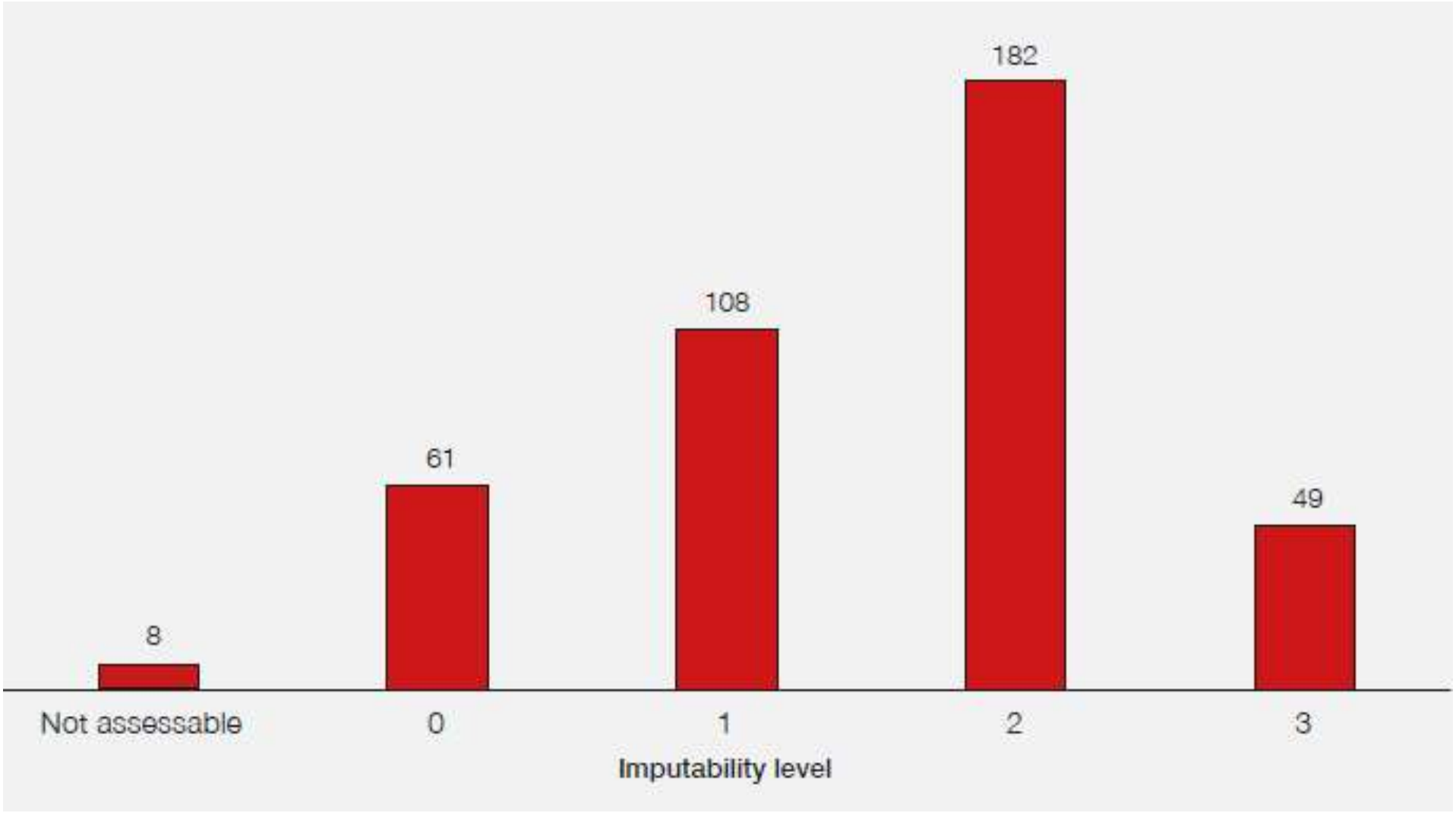


HSE=handling and storage errors

Blood establishment reports in the ‘other’ category



SAR reports by imputability reported to SABRE in 2018



Categories of major deficiencies found

Categories of other deficiencies found