FIGURES FROM THE ANNUAL SHOT REPORT 2023

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SHOT Serious Hazards of Transfusion

Figure 2.1: Haemovigilance reports submitted by year 2010-2023

Figure 2.2: The status of reports submitted to SHOT during 2023 (n=4972)

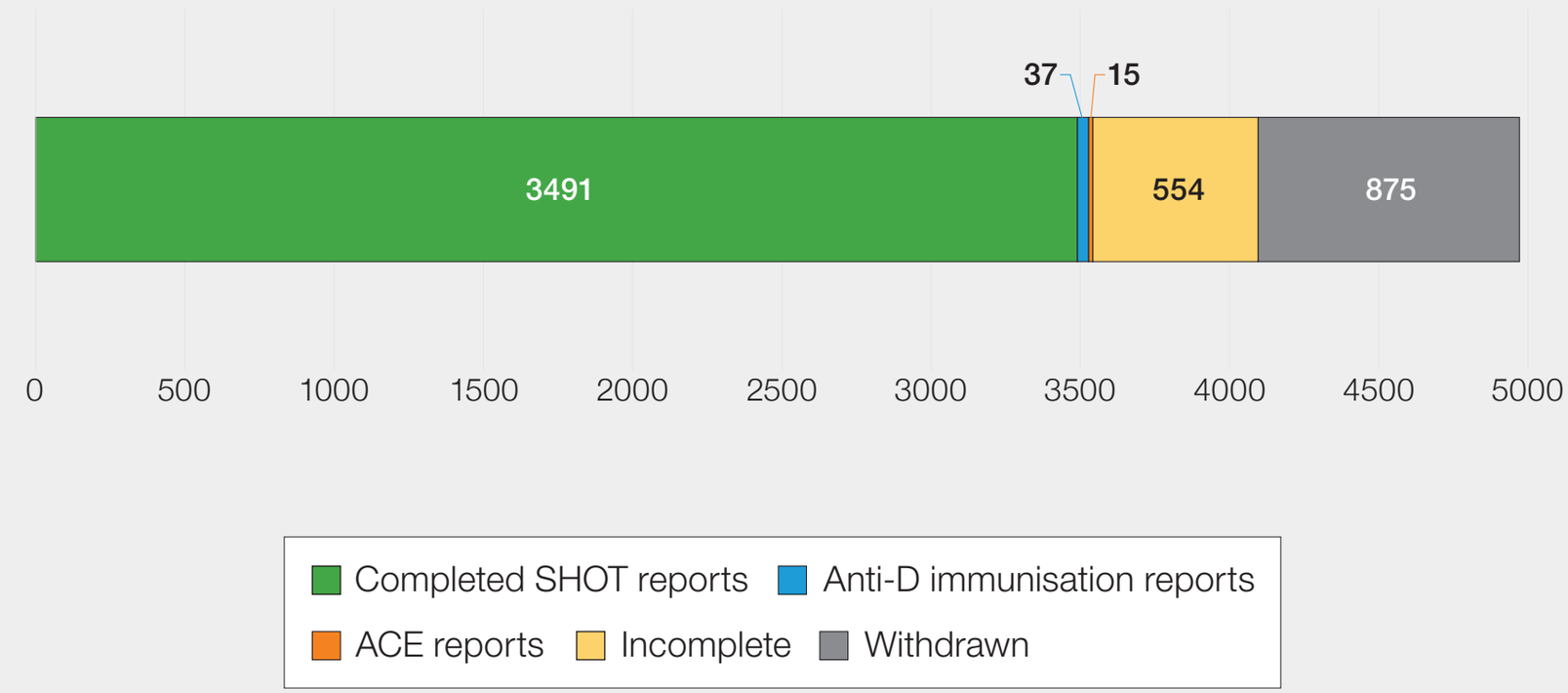
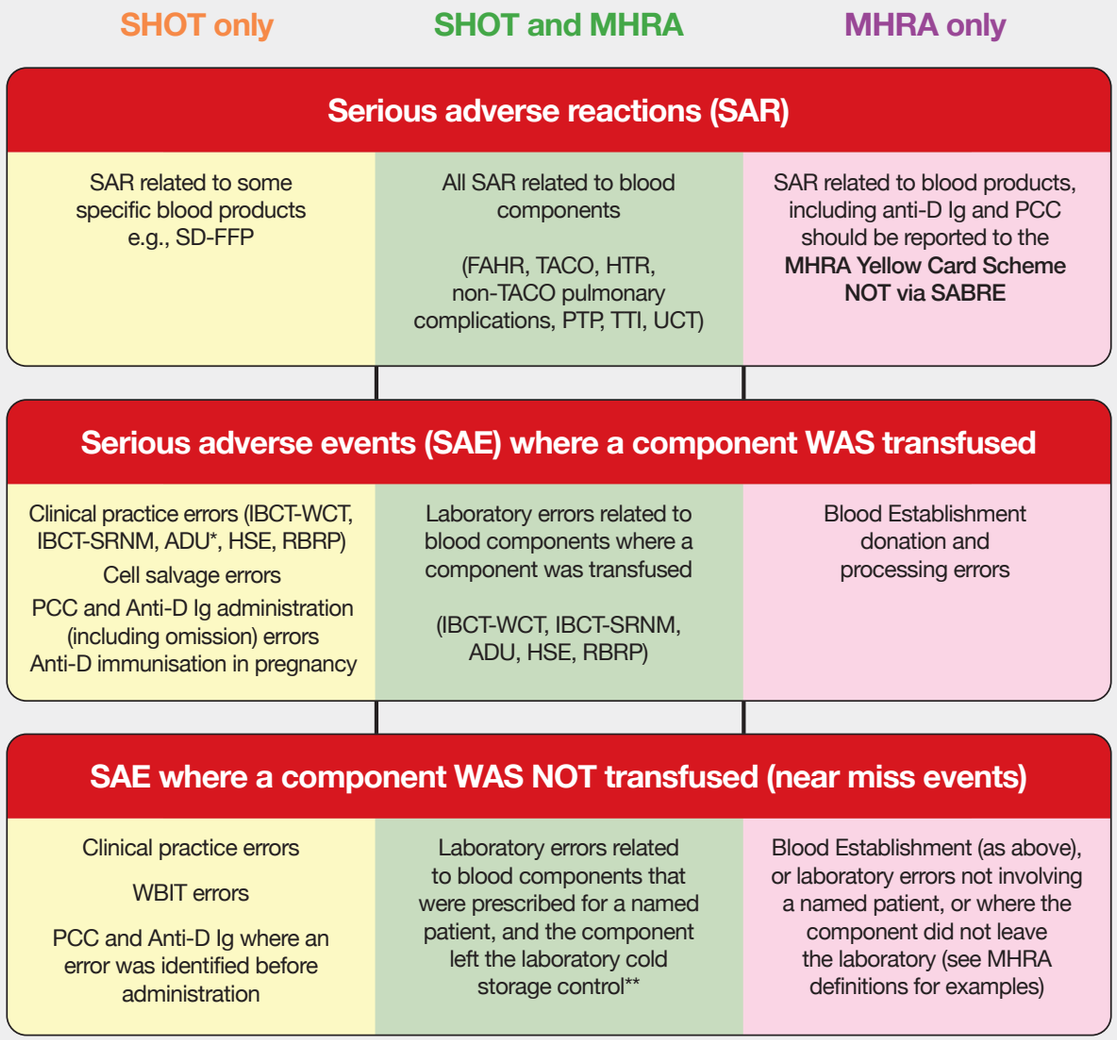


Figure 2.3: SHOT and the MHRA reporting criteria



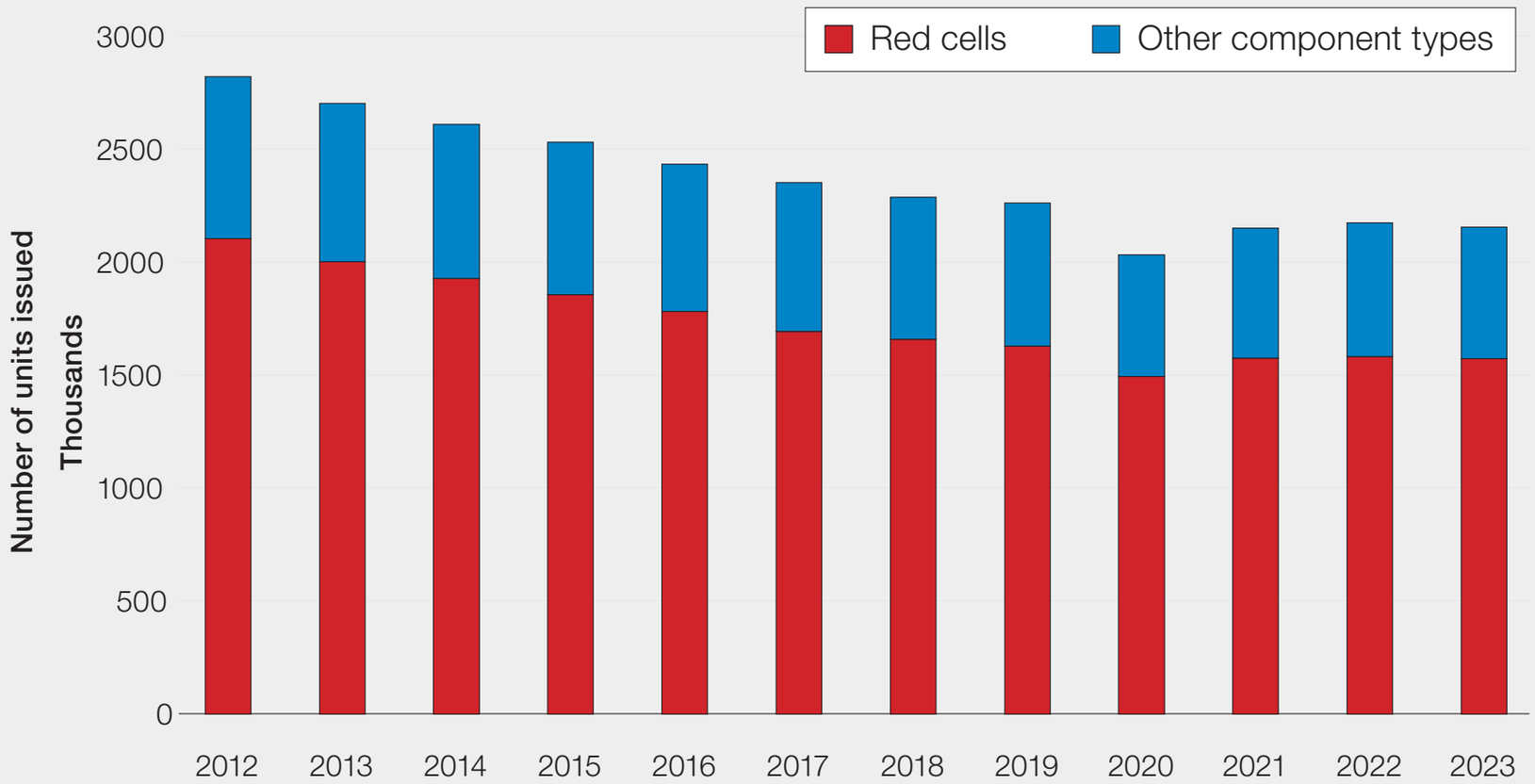
This infographic is for guidance purposes only. It may not cover all reportable events and does not represent a change to existing reporting requirements.

Full reporting definitions for SHOT and MHRA (Joint UK Haemovigilance User Guide) are available at: https://www.shotuk.org/reporting/ and for BSQR definitions of blood components/products see https://www.legislation.gov.uk/uksi/2005/50/made. A 'blood component' means a therapeutic constituent of human blood (red cells, white cells, platelets, and plasma) that can be prepared by various methods; while a 'blood product' means any therapeutic product derived from human blood or plasma.

* Includes cases where a component should have been transfused but was not due to a significant delay.
** Clinical errors relating to collection, storage and distribution, or where the primary error was in the laboratory, but detected later in the clinical area are MHRA-reportable.

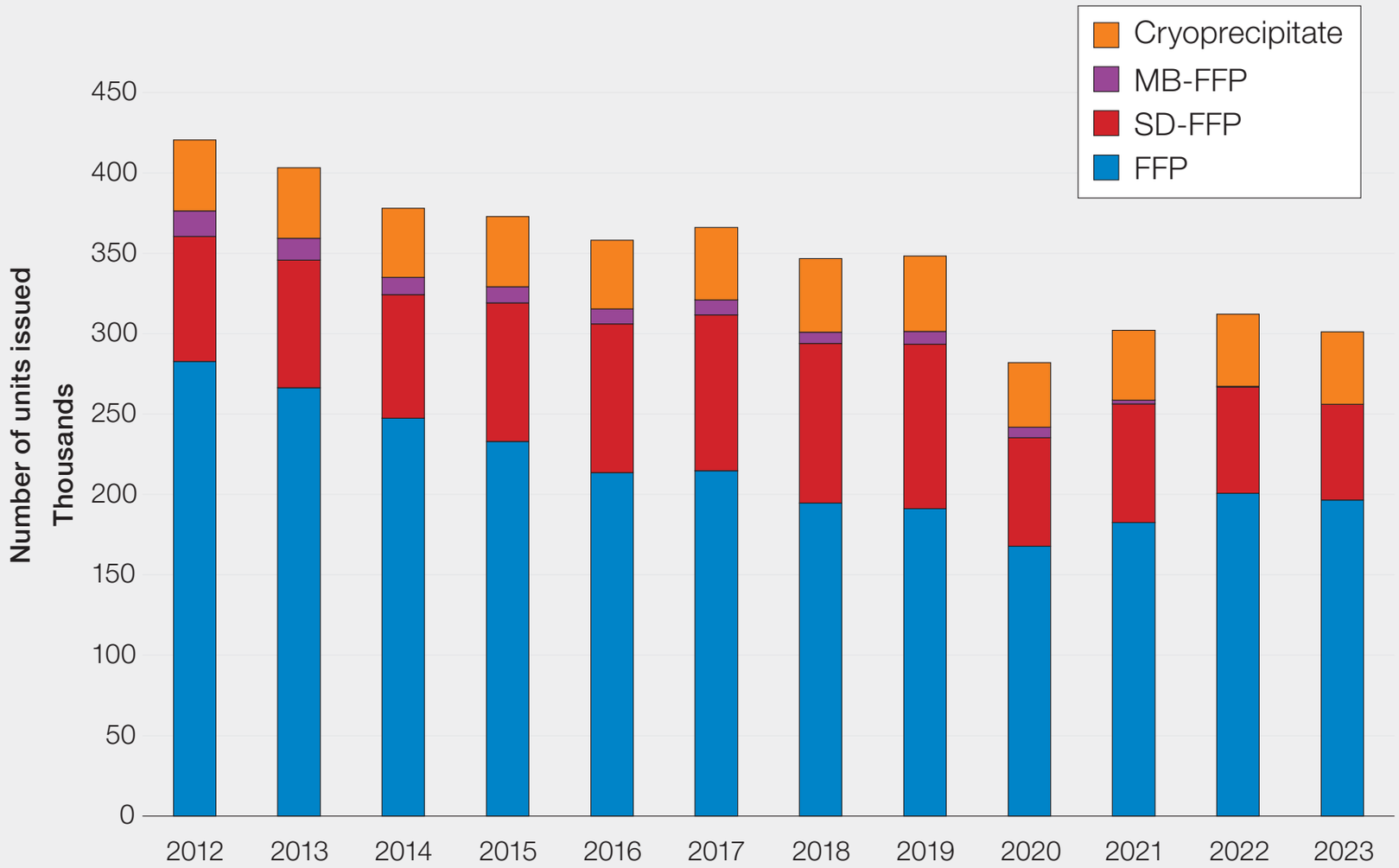
ADU=avoidable, delayed and under/overtransfusion; FAHR=febrile, allergic and hypotensive reactions; HSE=handling and storage errors; HTR=haemolytic transfusion reactions; IBCT-SRNM=incorrect blood component transfused-specific requirements not met; IBCT-WCT=IBCT-wrong component transfused; Ig=immunoglobulin; MHRA=Medicines and Healthcare products Regulatory Agency; PCC=prothrombin complex concentrates; PTP=post-transfusion purpura; RBRP=right blood right patient; SABRE=Serious Adverse Blood Reactions and Events; SD-FFP=solvent-detergent fresh frozen plasma; TACO=transfusion-associated circulatory overload; TTI=transfusion transmitted infections; UCT=uncommon complications of transfusion; WBIT=wrong blood in tube

Figure 2.4a: Blood component issue data in the UK 2012-2023



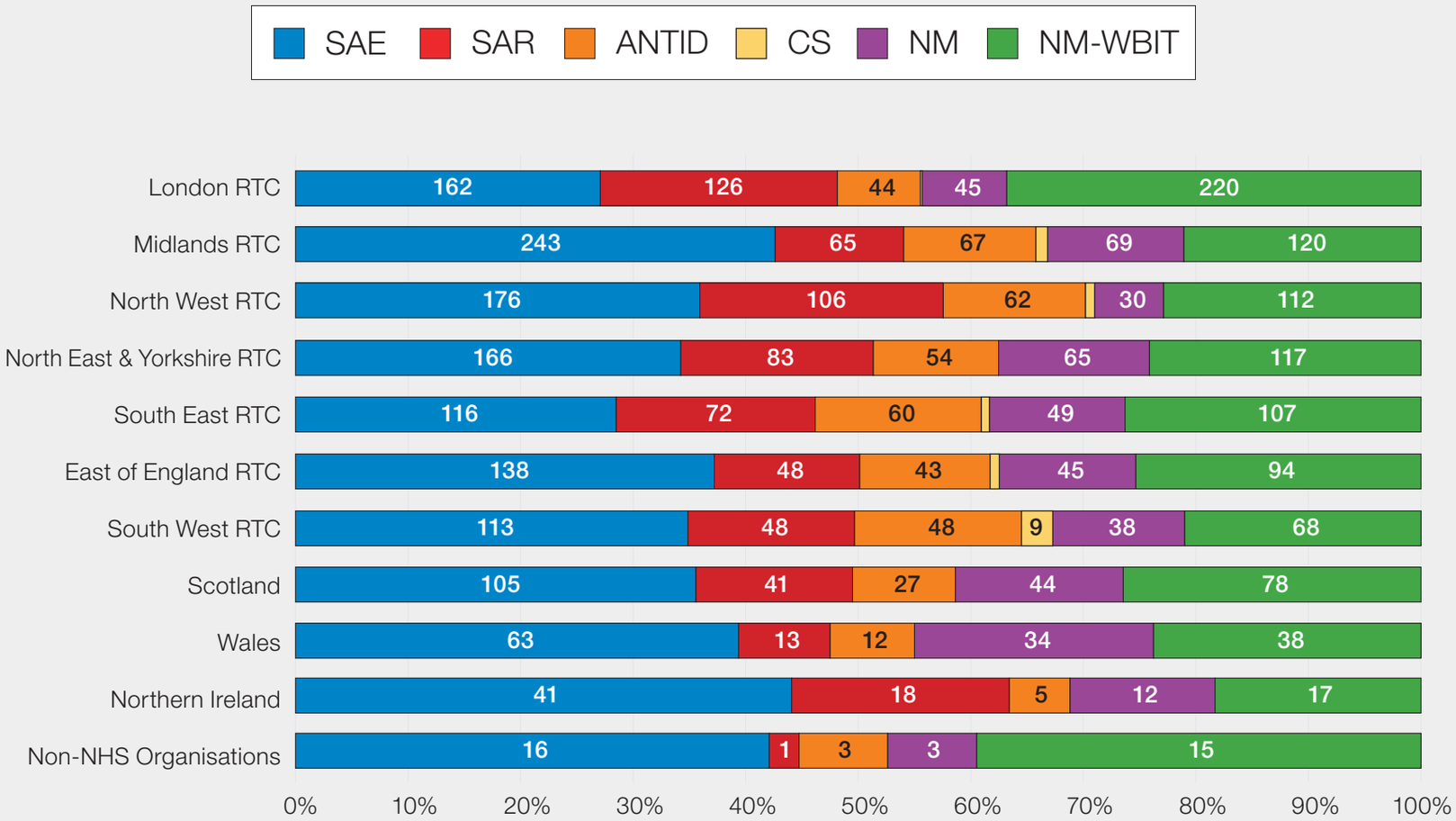
Includes solvent-detergent fresh frozen plasma

Figure 2.4b: Non-cellular component issue data in the UK 2012-2023



FFP=fresh frozen plasma; SD=solvent-detergent; MB=methylene blue

Figure 2.5: Number and percentage of reports in each region/country by category in 2023



ANTID=anti-D immunoglobulin errors; CS=cell salvage; NM=near miss; RTC=regional transfusion committee; SAE=serious adverse event; SAR=serious adverse reaction; WBIT=wrong blood in tube
Note: numbers for CS are too small to be displayed on the figure for most RTC areas

Figure 2.6: Number of NHS organisations submitting in reporting categories 2011 versus 2022

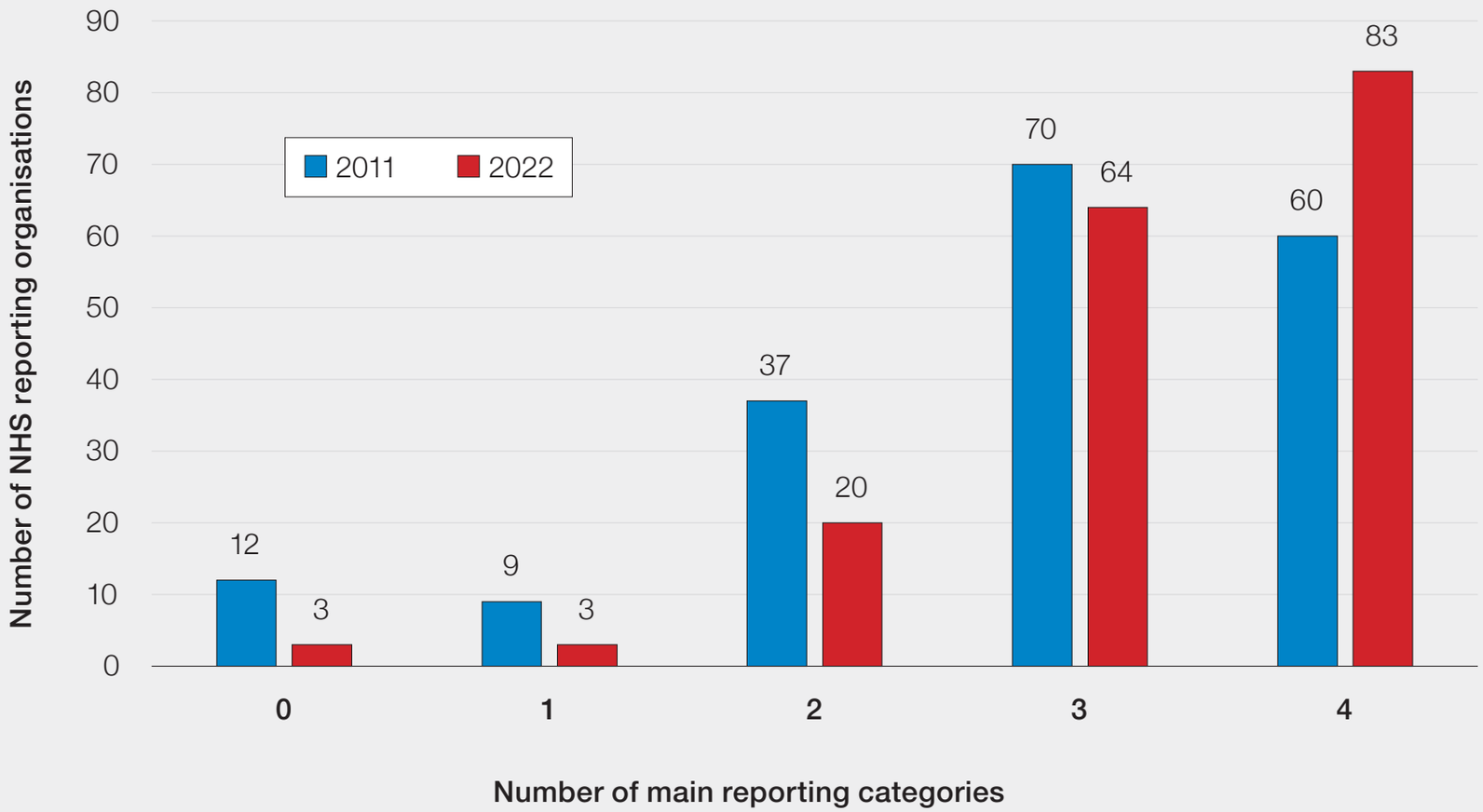


Figure 3.1: Errors account for most reports in 2023 (n=3184/3833)

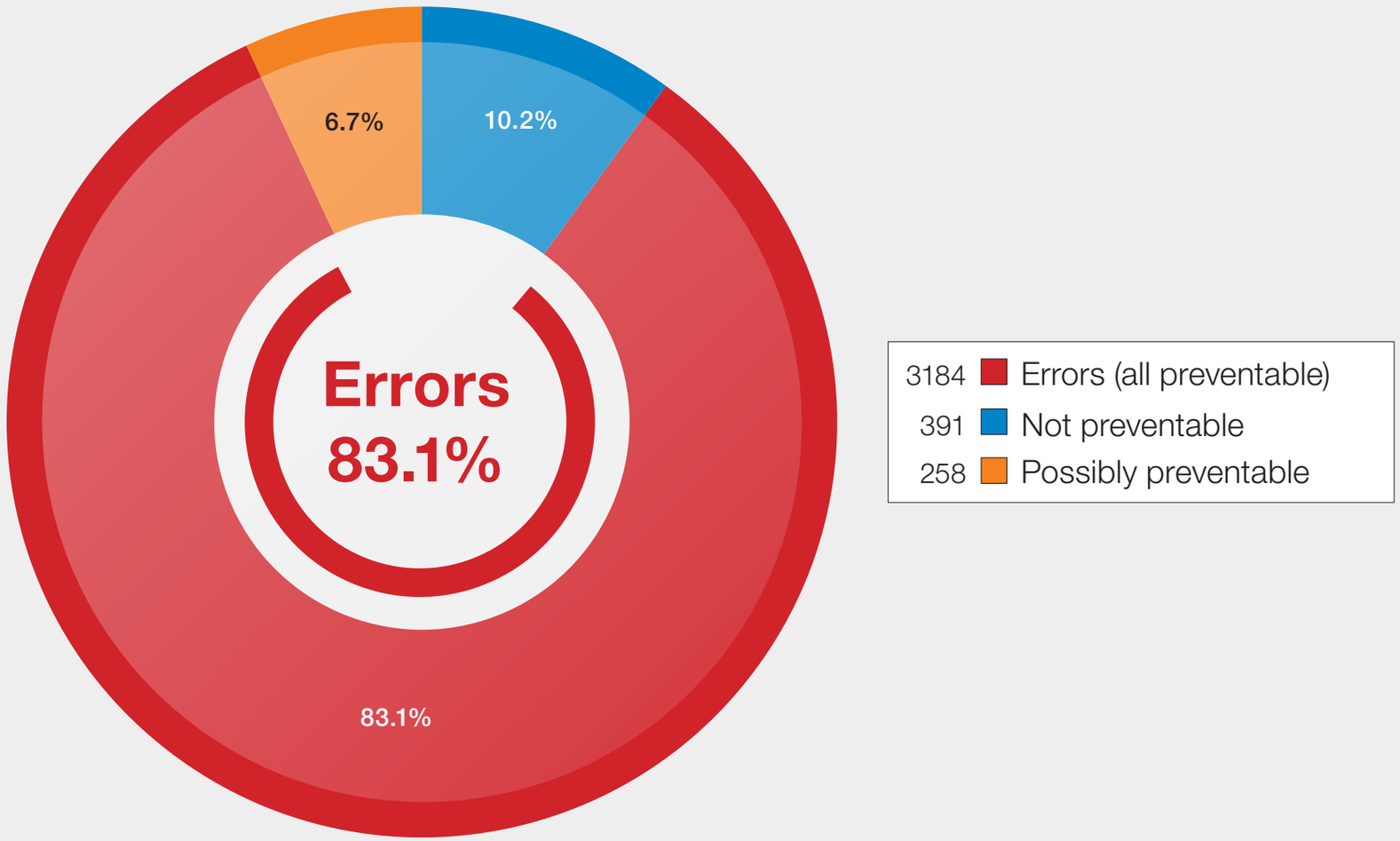
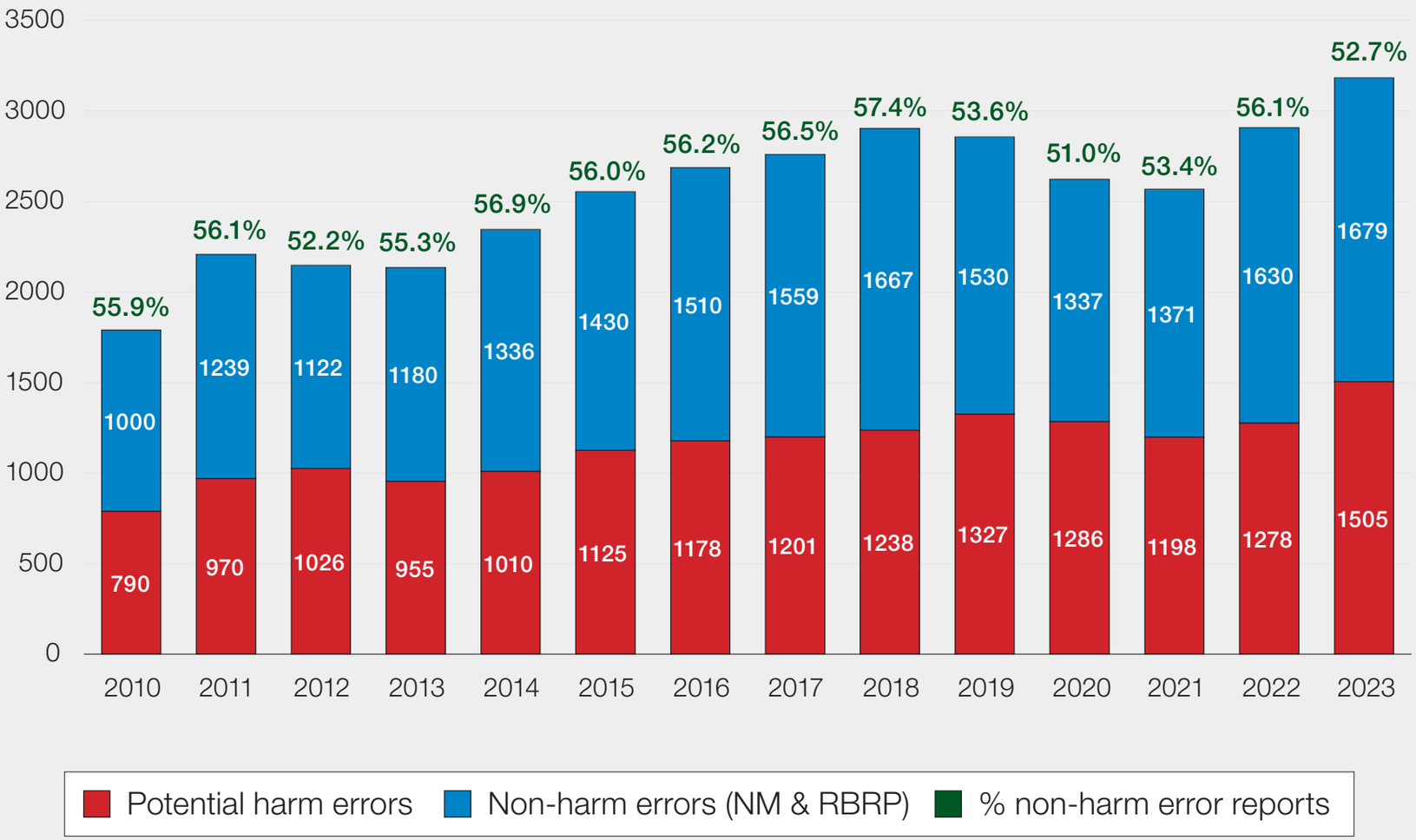
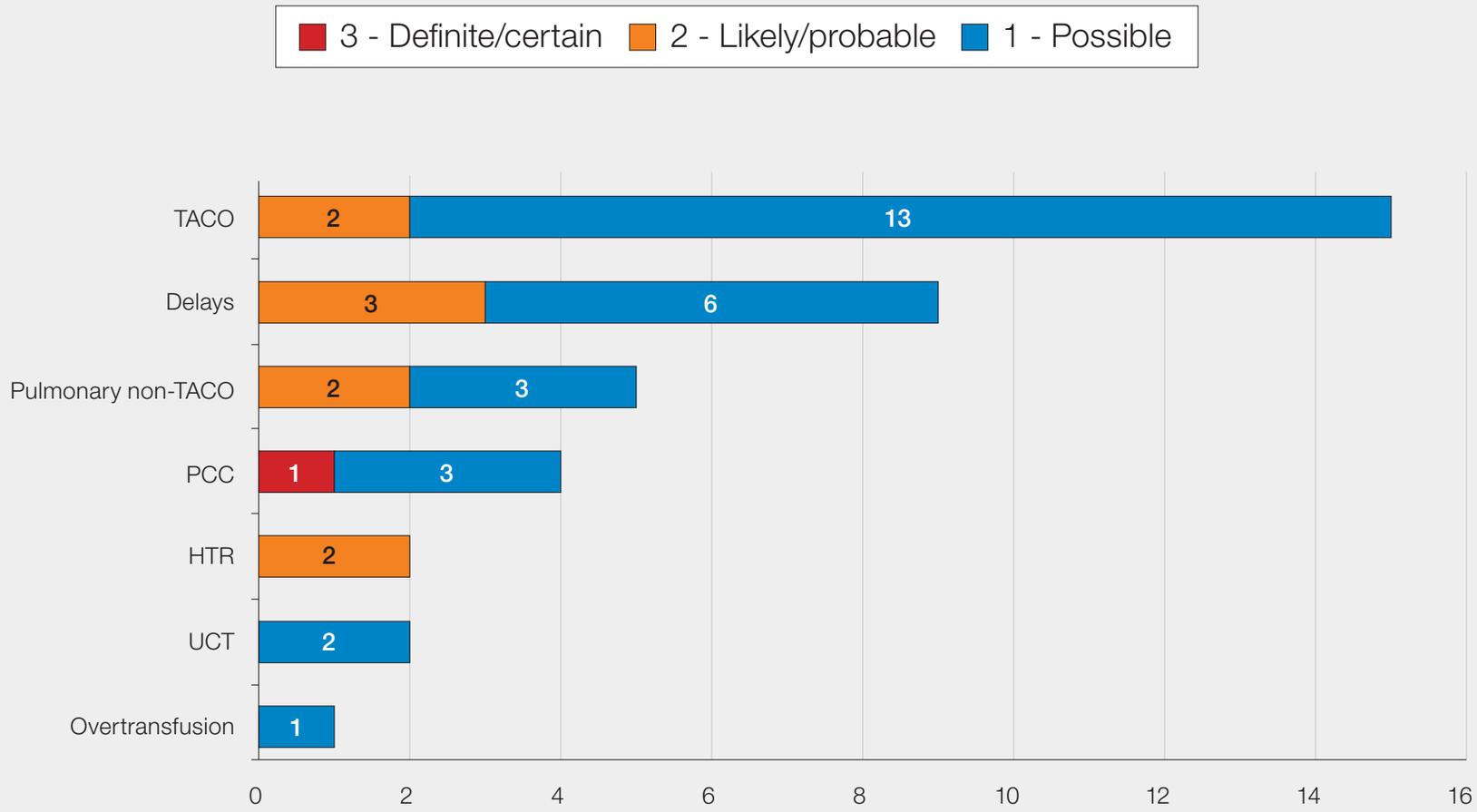


Figure 3.2: No patient-harm and potential patient-harm incidents 2010-2023



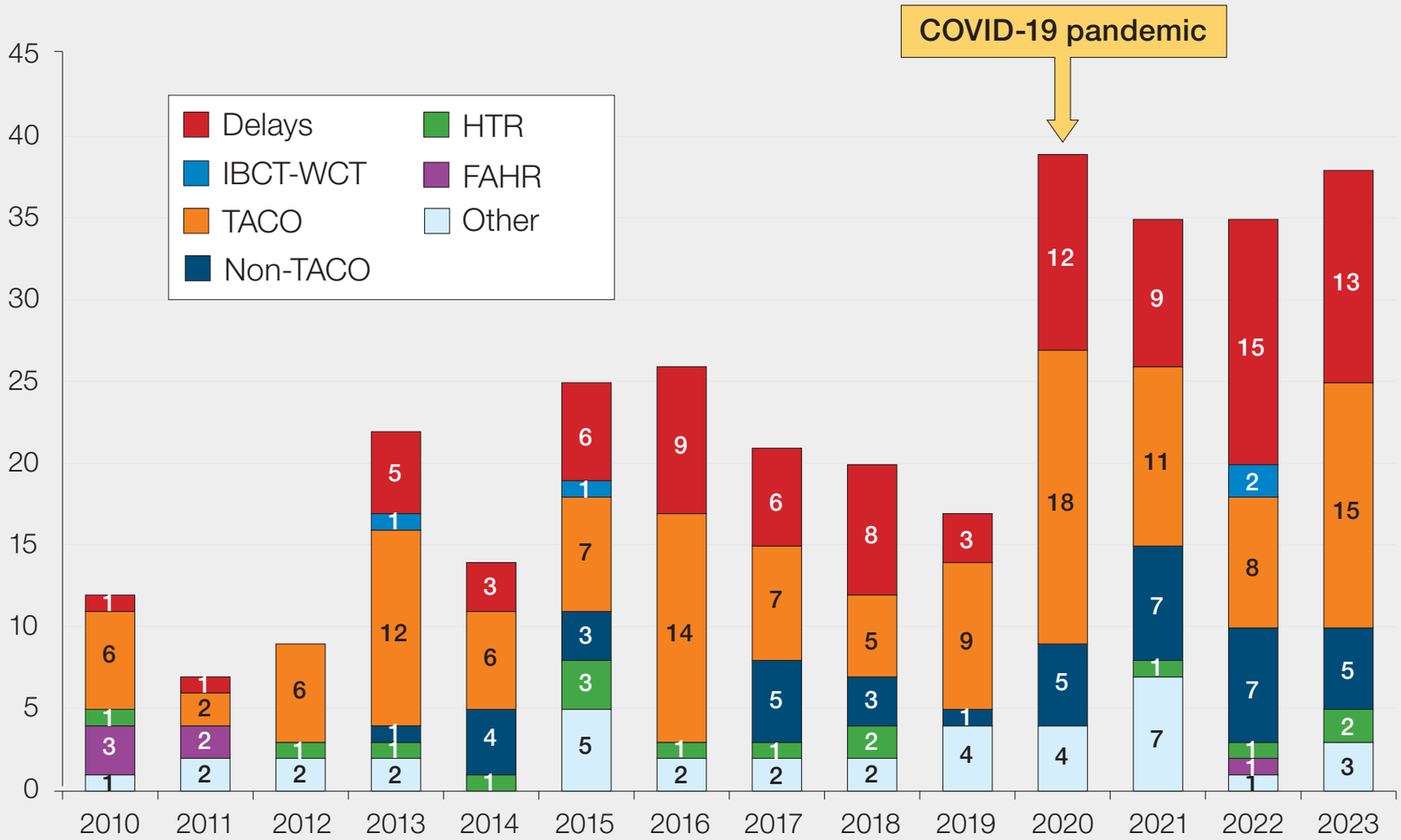
Potential harm incidents include incorrect blood component transfused (IBCT) errors, avoidable, delayed and under/overtransfusion (ADU) errors, handling and storage errors (HSE) and errors related to anti-D immunoglobulin administration. Non-harm incidents include near miss (NM) and right blood right patient (RBRP) errors

Figure 3.3: Deaths related to transfusion with imputability reported in 2023 (n=38)



HTR=haemolytic transfusion reactions; UCT=uncommon complications of transfusion; TACO=transfusion-associated circulatory overload; PCC=prothrombin complex concentrates

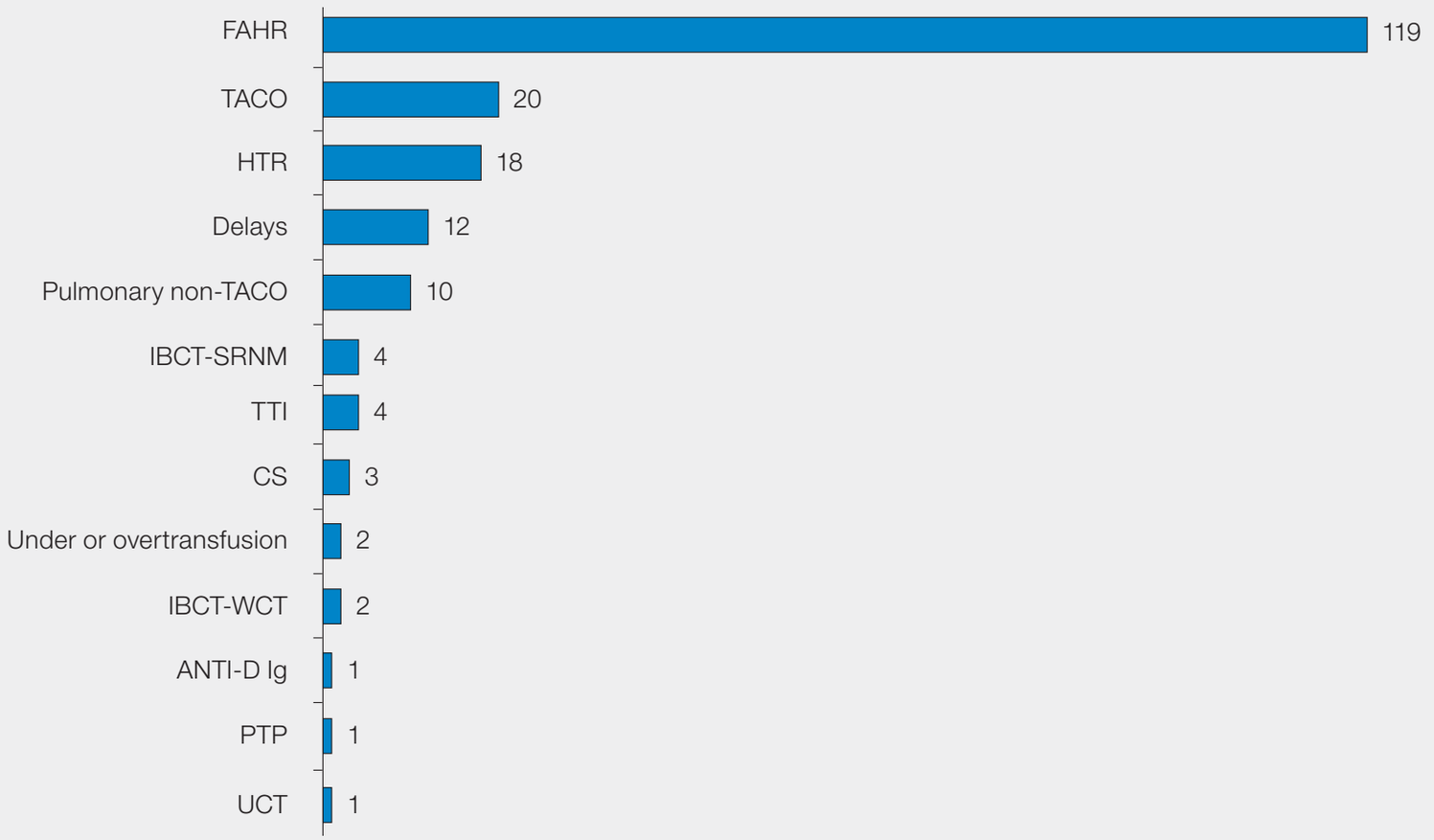
Figure 3.4: Transfusion-related deaths 2010 to 2023 (n=320)



IBCT-WCT=incorrect blood component transfused-wrong component transfused; TACO=transfusion-associated circulatory overload; HTR=haemolytic transfusion reaction; FAHR=febrile, allergic and hypotensive reactions

Delays include 1 delay related to PCC in 2019, 2 in 2022 and 4 in 2023; 'Other' includes 1 each for post-transfusion purpura, transfusion-associated graft-versus-host disease (2012) and anti-D Ig related; there were 9 in the avoidable, over or undertransfusion category, 3 transfusion-transmitted infections, and 22 deaths related to other unclassified reactions

Figure 3.5: Ranking of categories to show number of serious reactions in 2023 (n=197)



FAHR=febrile, allergic and hypotensive reactions; TACO=transfusion-associated circulatory overload; HTR=haemolytic transfusion reactions; IBCT-SRNM=incorrect blood component transfused-specific requirements not met; IBCT-WCT=IBCT-wrong component transfused; CS=cell salvage; PTP=post-transfusion purpura; TTI=transfusion transmitted infections; UCT=uncommon complications of transfusion

Figure 3.6: Summary data for 2023, all categories (includes RBRP and NM) (n=3833)

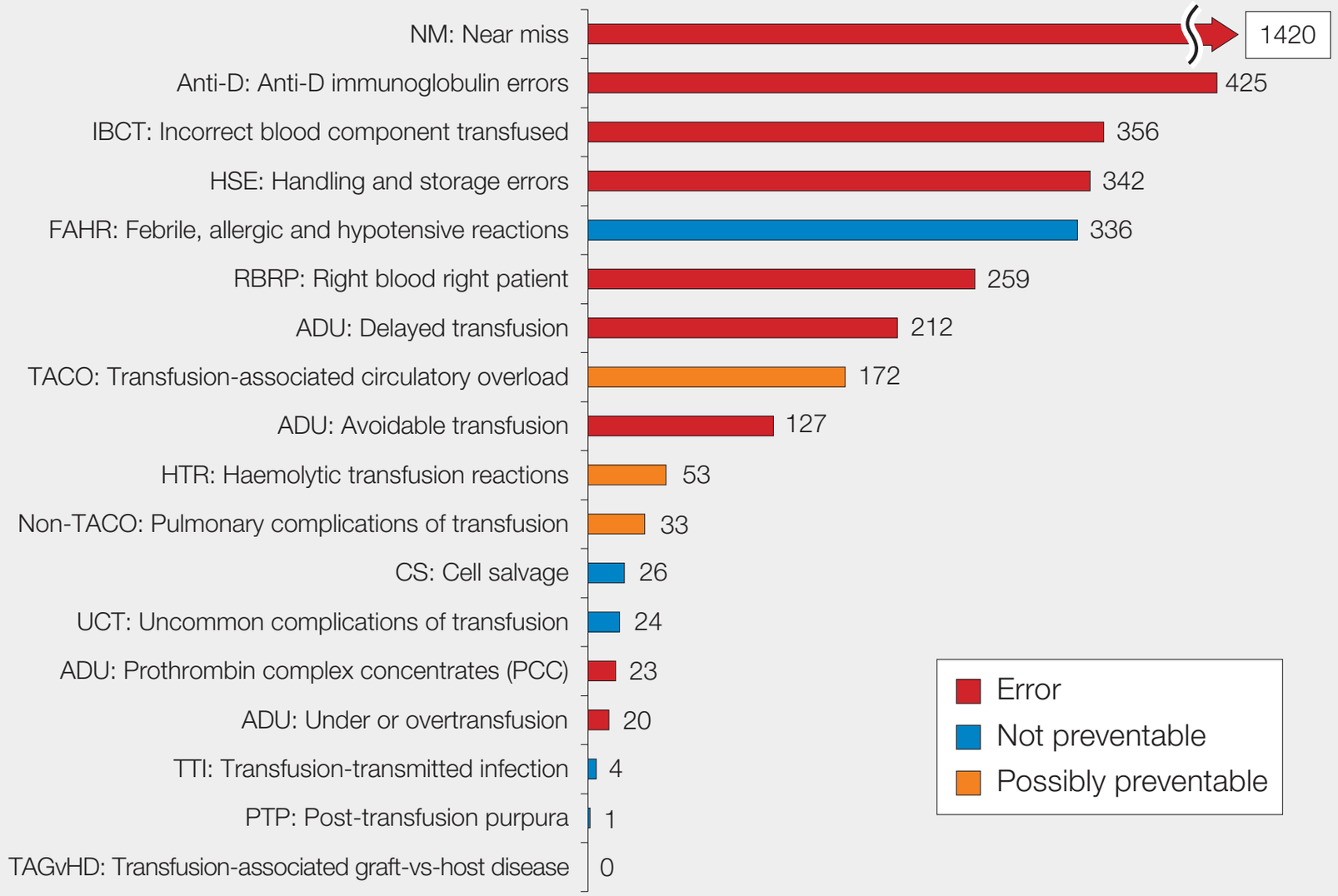
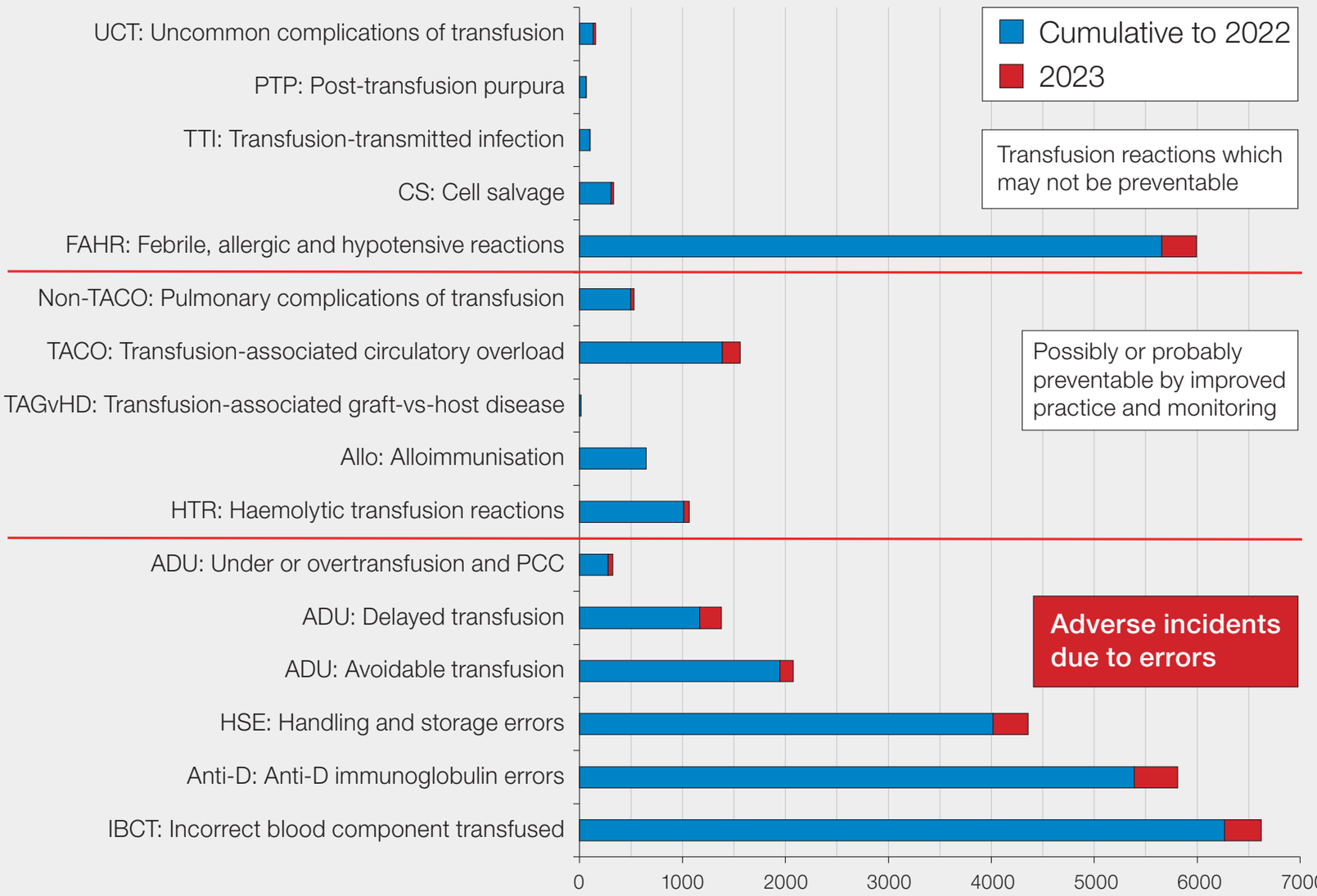


Figure 3.7: Cumulative data for SHOT categories 1996-2023 (n=31025)



**Data on alloimmunisation is no longer collected by SHOT since 2015*

Figure 3.8: Number of ABO-incompatible red cell transfusions 2014-2023

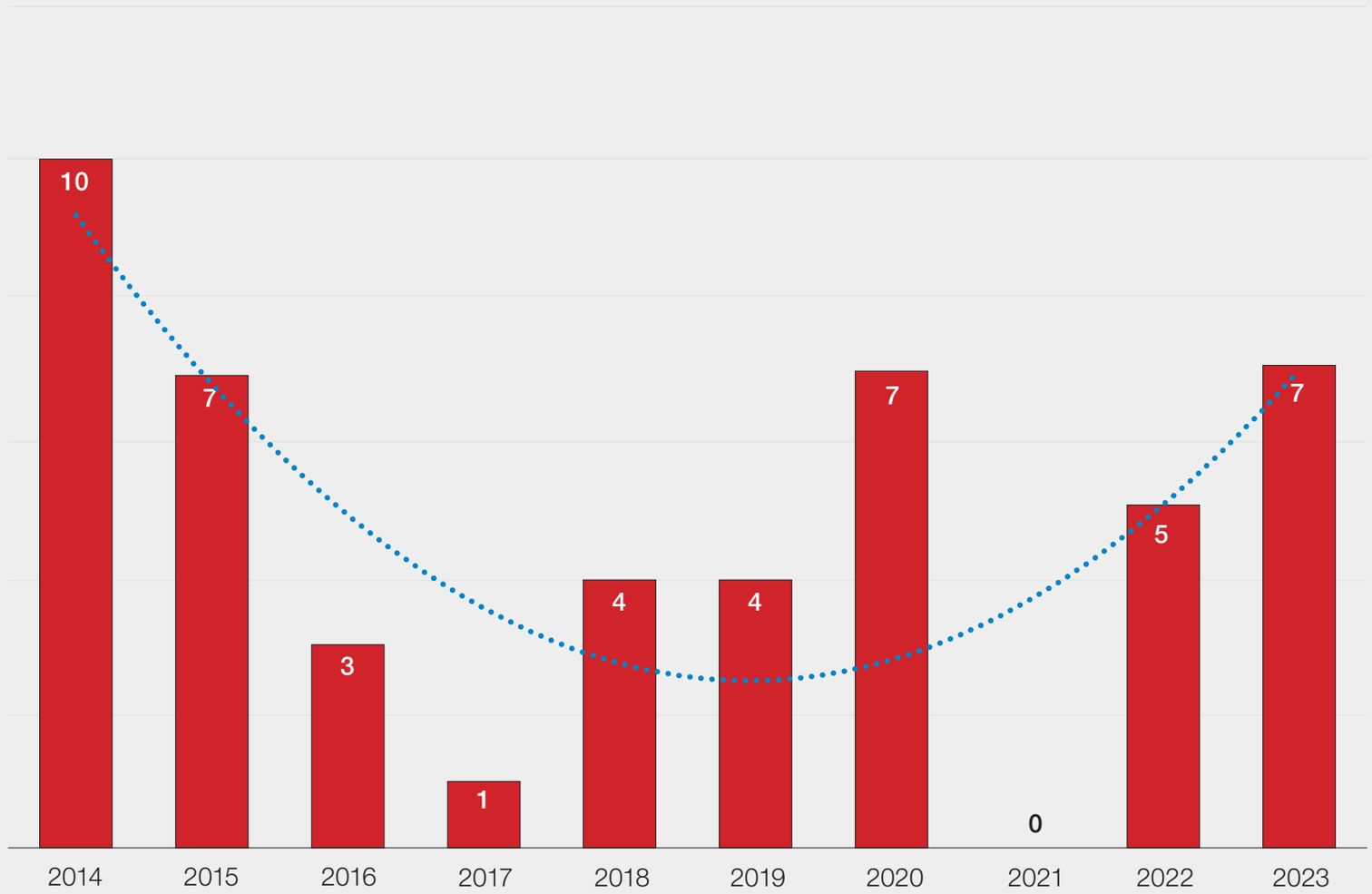


Figure 3.9: Number of ABO-incompatible plasma transfusions 2014-2023

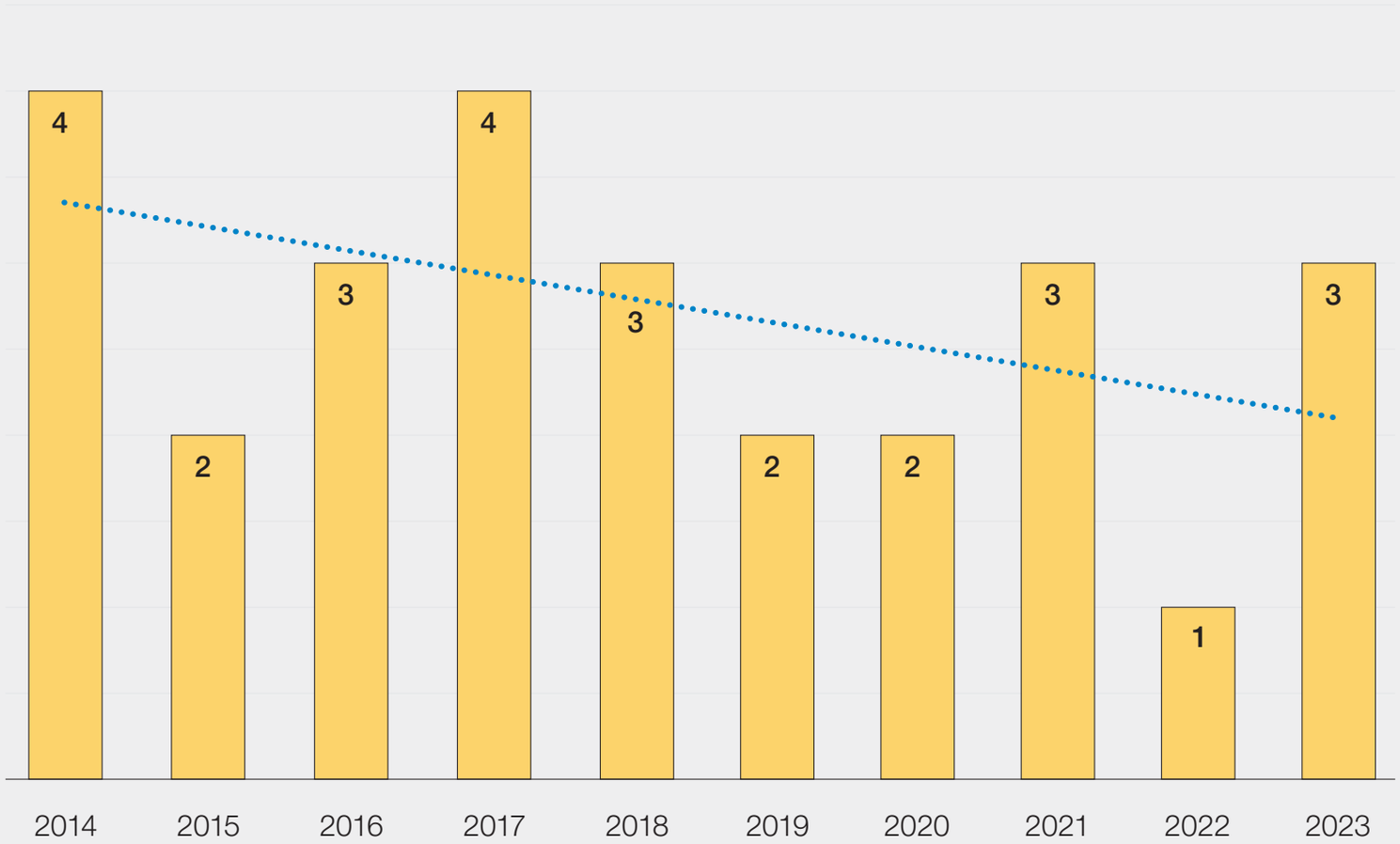
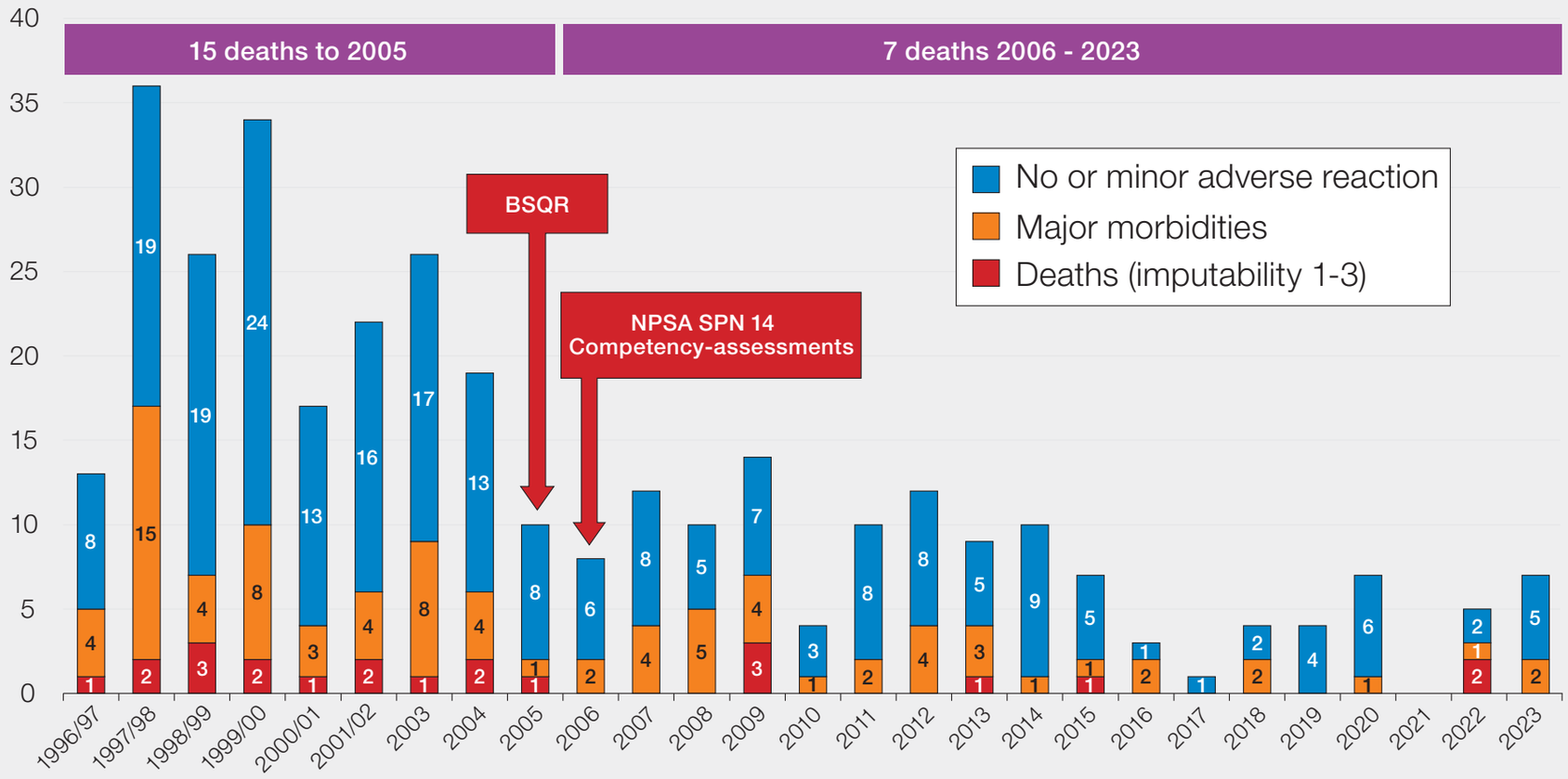


Figure 3.10: Outcome of ABO-incompatible red cell transfusions in 26 years of SHOT reporting



BSQR=Blood Safety and Quality Regulations; NPSA=National Patient Safety Agency; SPN=safer practice notice

Figure 3.11: ABO-incompatible transfusions and outcome by groups 2010-2023 (n=81)

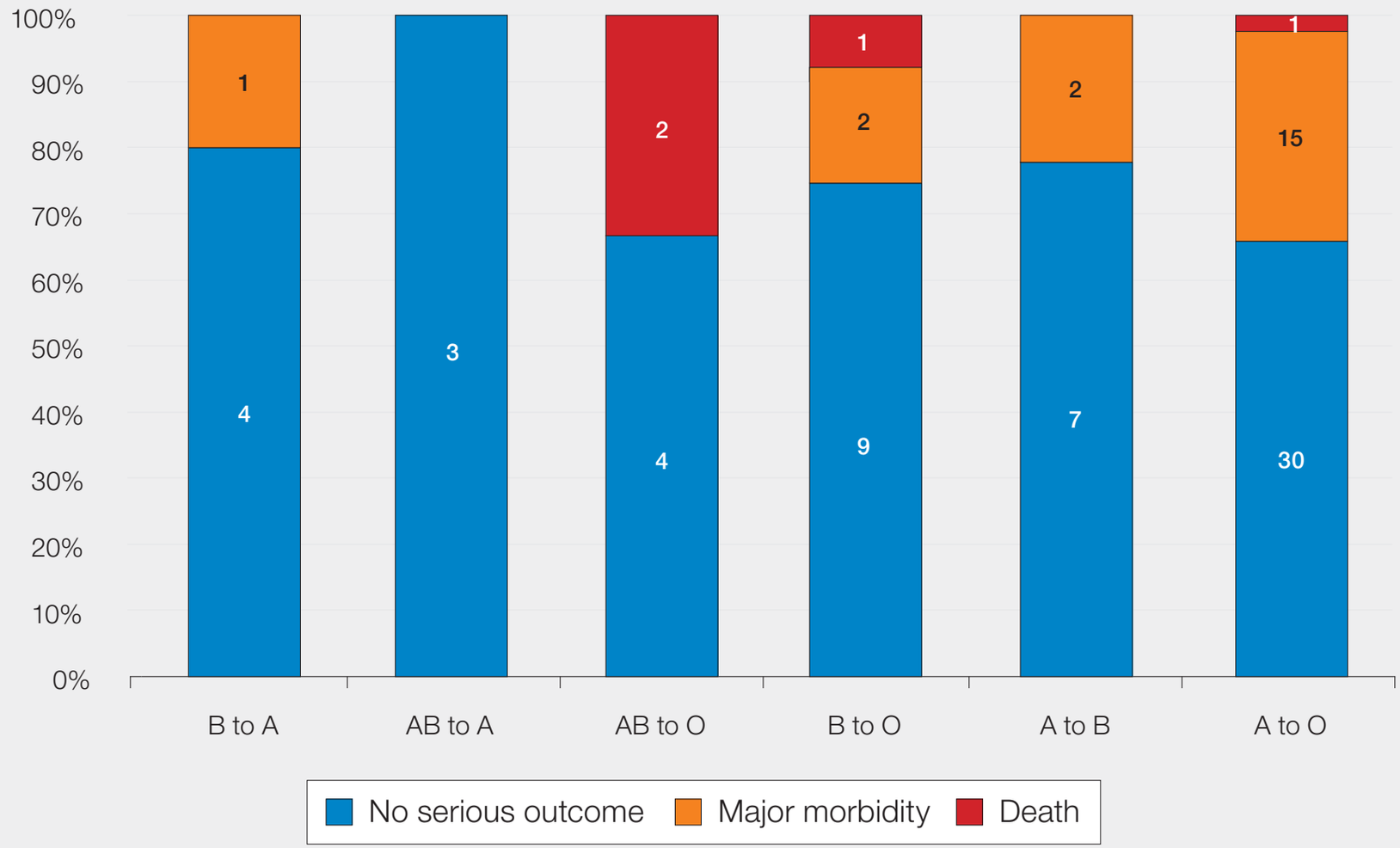


Figure 3.12: ABO-incompatible red cell transfusions 2016-2023: few events (n=31) but many near misses (n=2390)

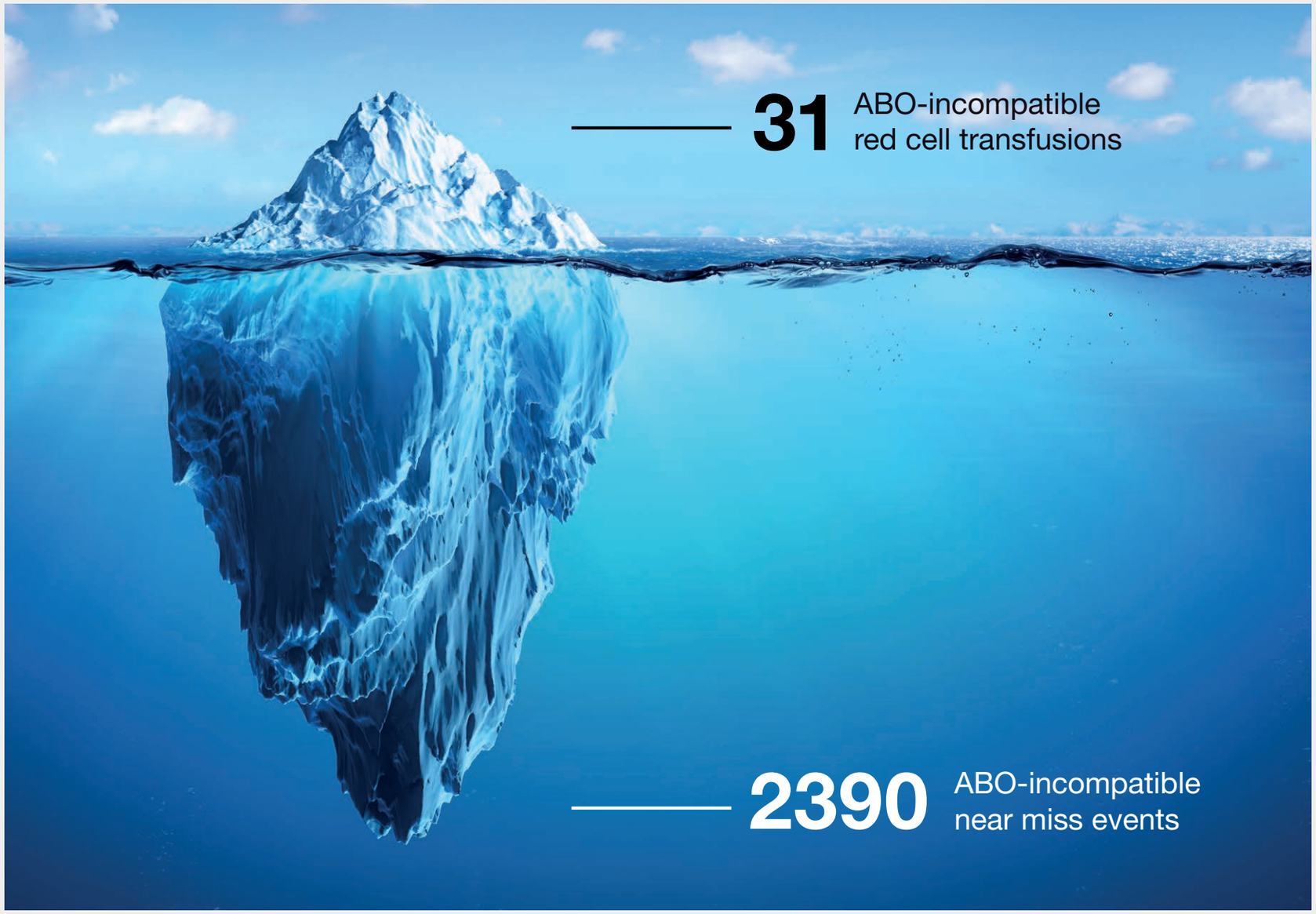
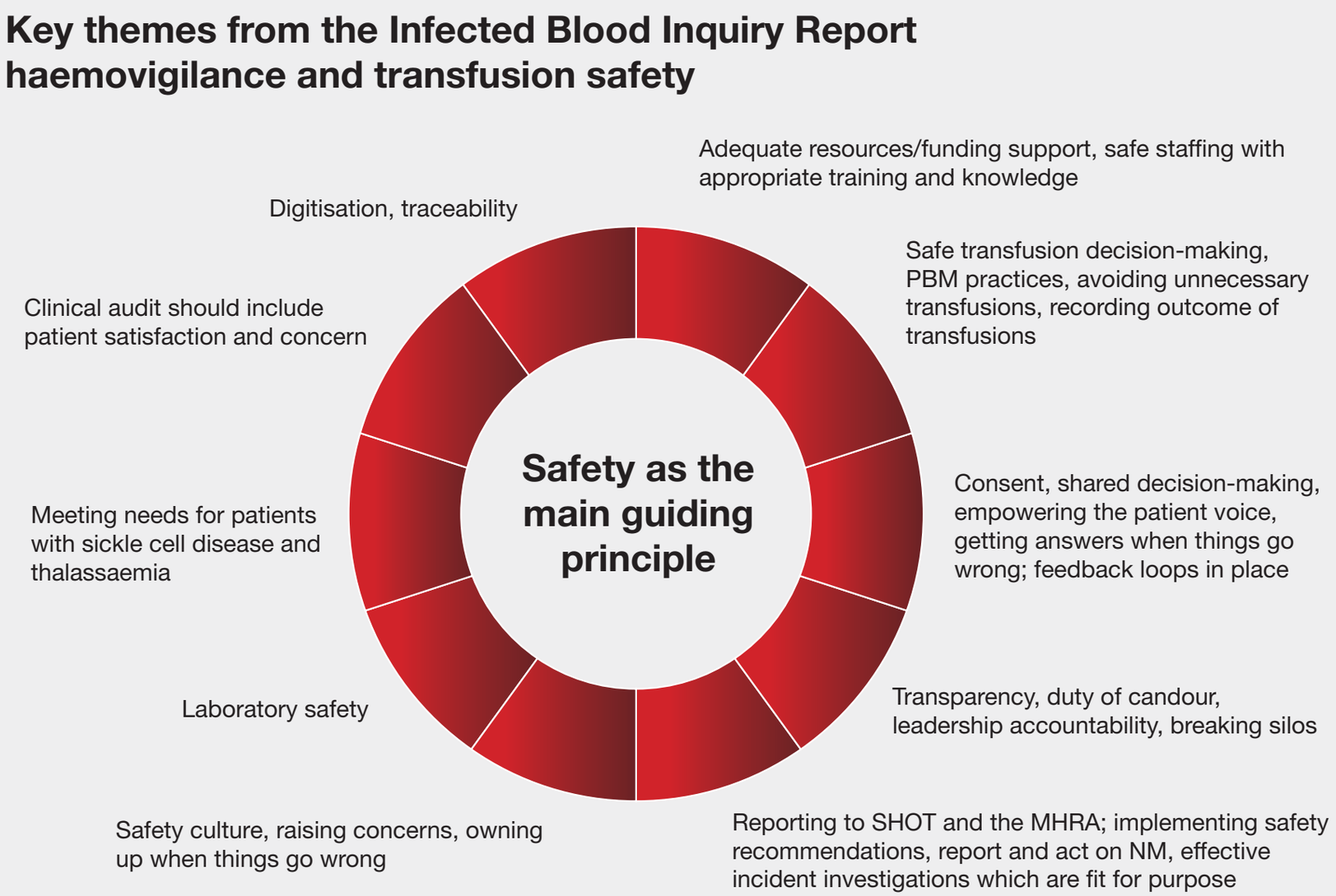
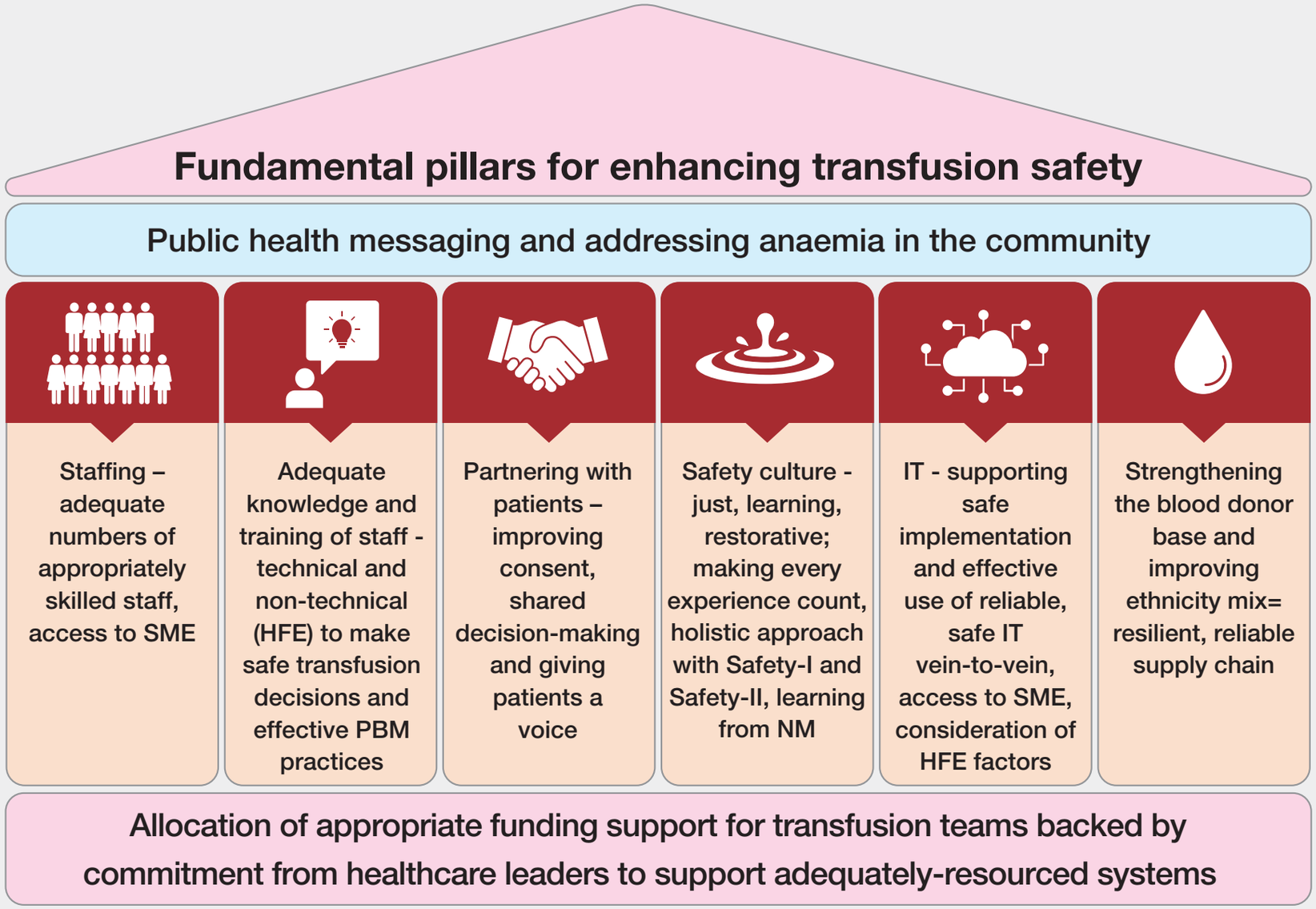


Figure 5.1: Key themes from the IBI Report related to haemovigilance and transfusion safety (IBI, 2024)



MHRA=Medicines and Healthcare products Regulatory Agency; NM=near miss; PBM=patient blood management

Figure 5.2: Fundamental pillars enhance transfusion safety in the UK



HFE=Human factors and ergonomics; IT=information technology; NM=near miss; PBM=patient blood management; SME=subject matter expert

Figure 6.1: What is psychological safety at work? How leaders can build psychologically safe workplaces

Reproduced with permission from by the Center for Creative Leadership, Originally published in 'What Is Psychological Safety at Work? How Leaders Can Build Psychologically Safe Workplaces'

Figure 6.2: Lagging versus leading indicators

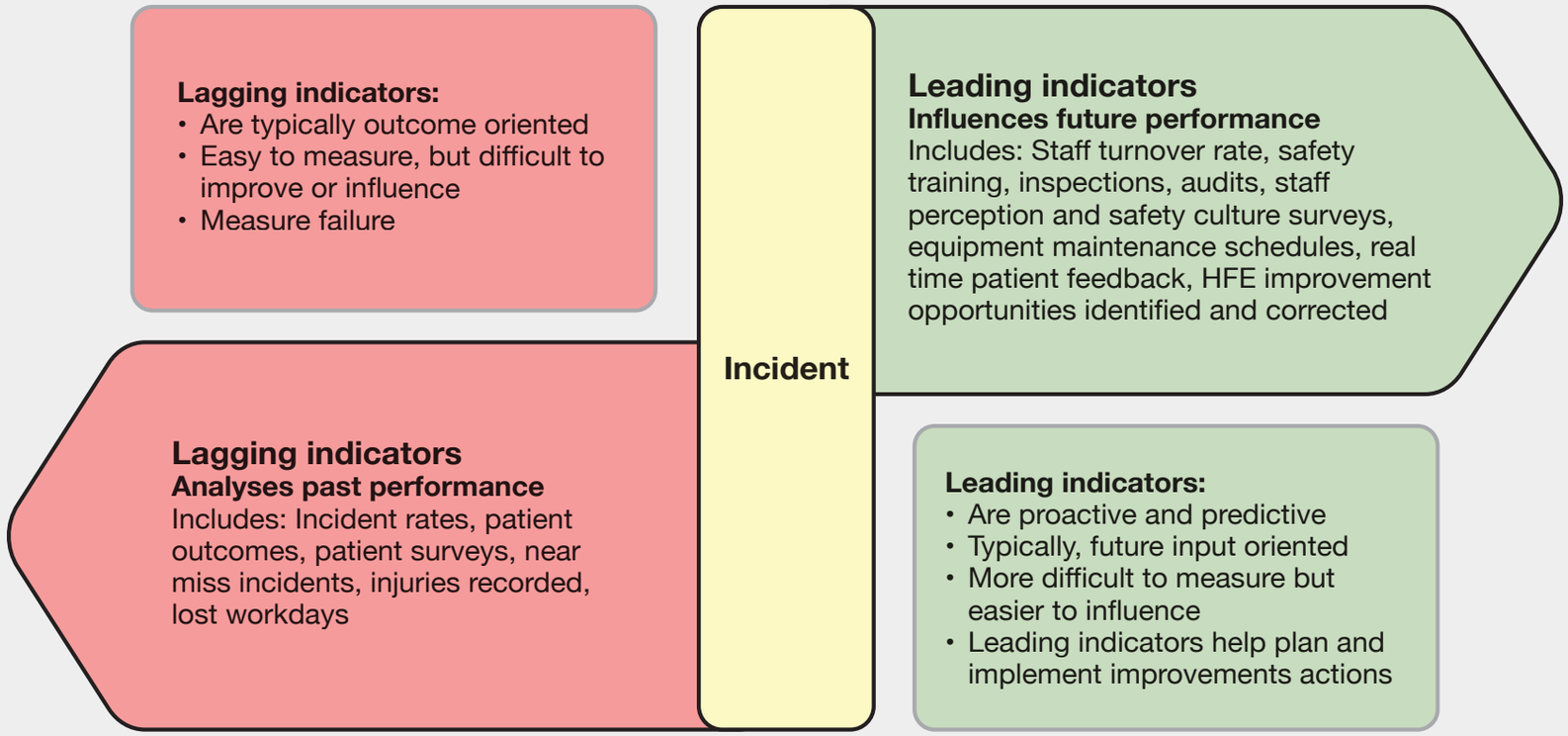
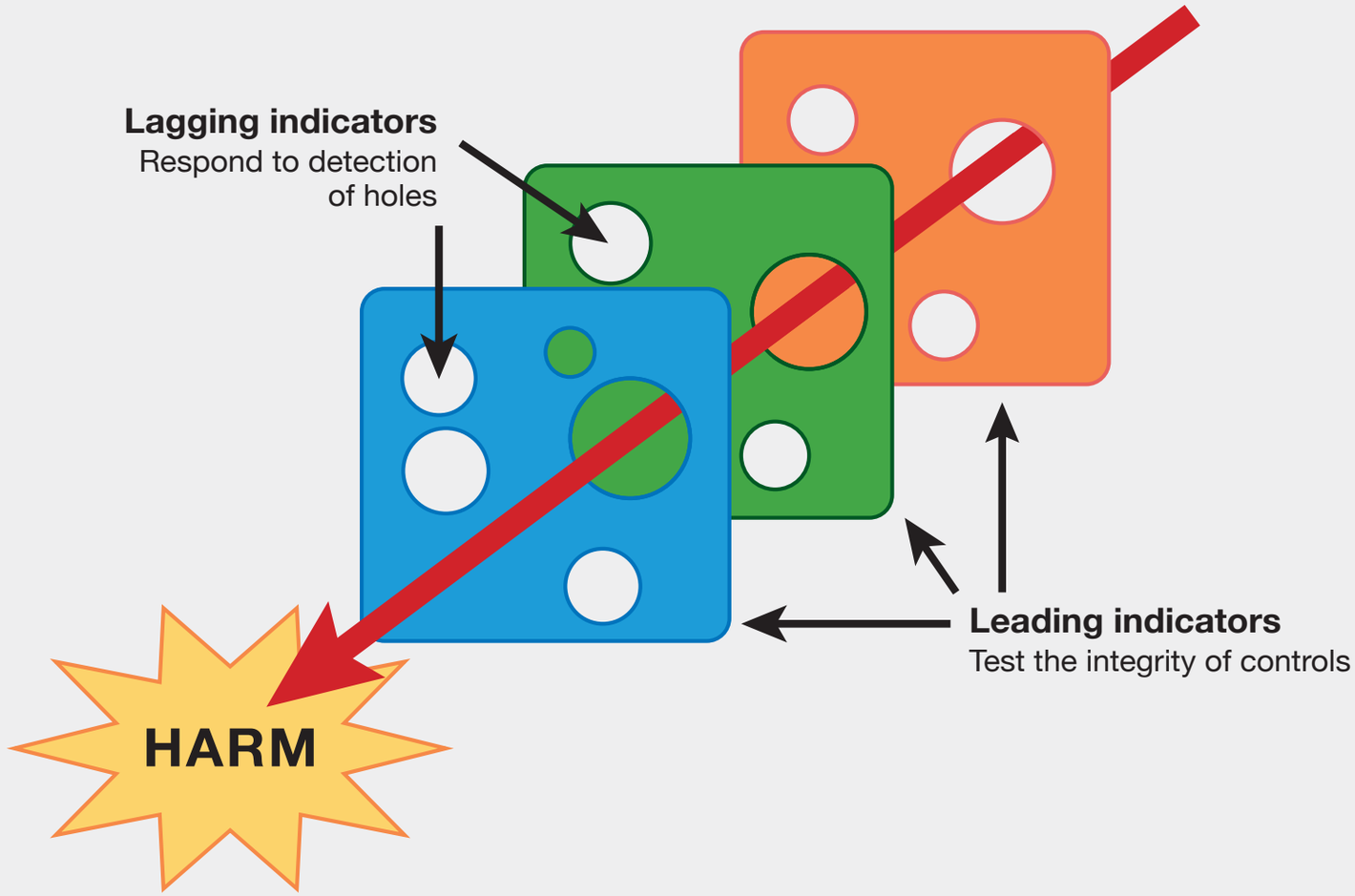
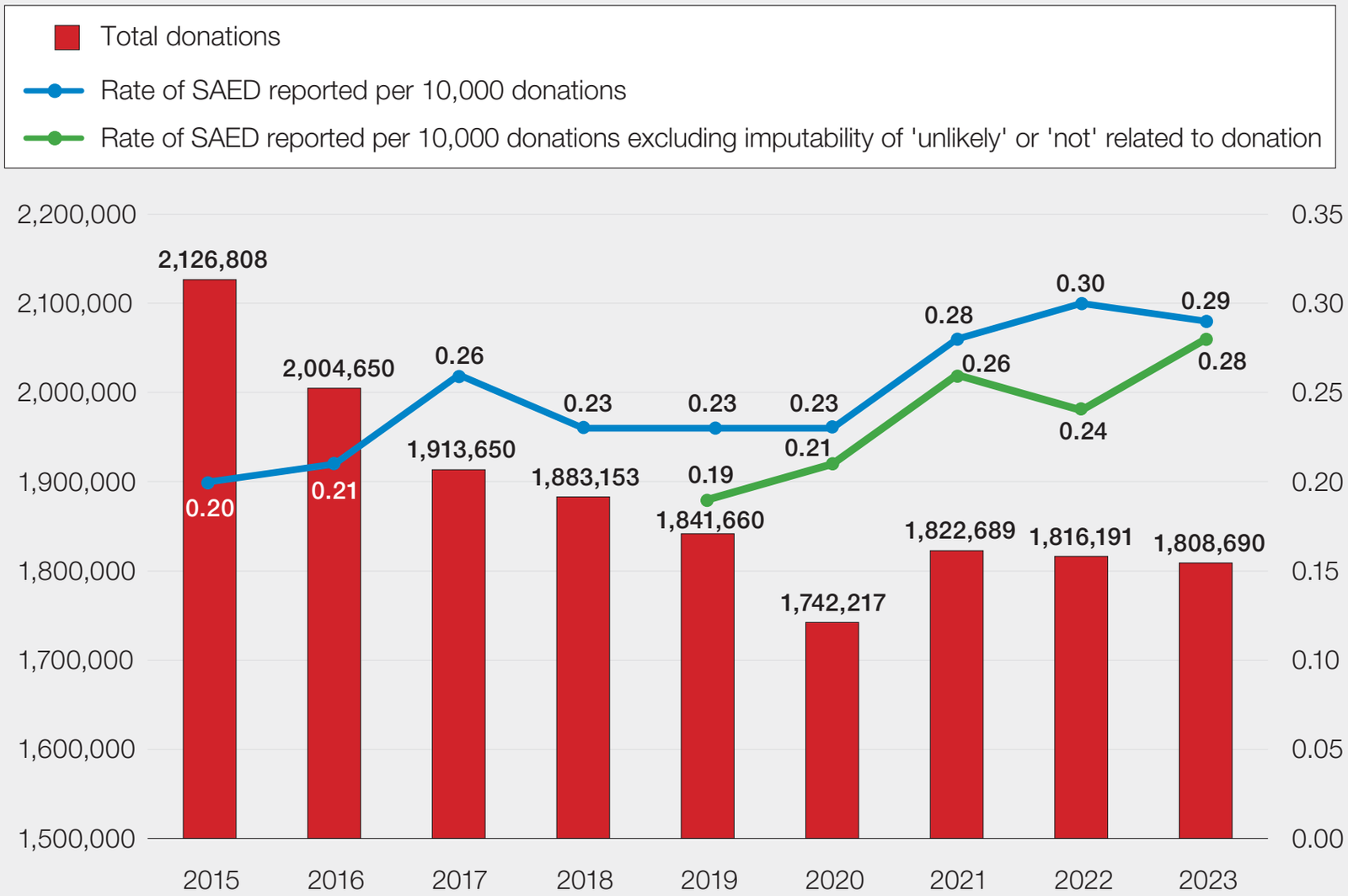


Figure 6.3: Safety performance indicators and the Swiss cheese model



Source: https://risktec.tuv.com/knowledge-bank/measuring-safety-safety-related-key-performance-indicators/, The 'Swiss cheese model' of accident causation was originally proposed by James Reason focussing on the systemic failures of safeguard and barriers that can result in patient harm

Figure 7.1: Rate of SAED reported per 10,000 donations in the UK 2015-2023



SAED=serious adverse event of donation; UK=United Kingdom

Figure 8.1: A comparison of HFIT categories assigned by SHOT reporters in 2022 and 2023

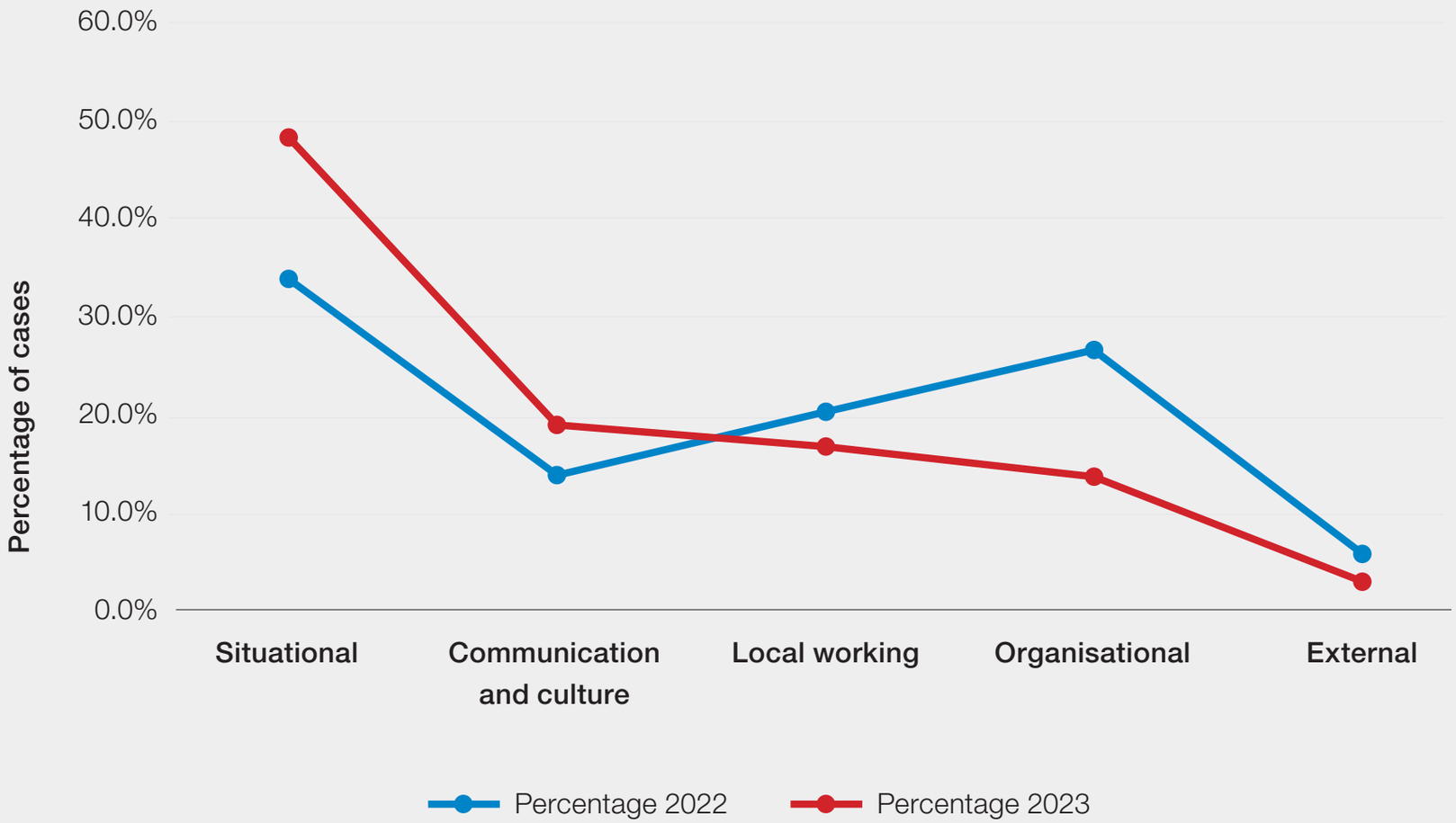


Figure 8.2: Percentage of cases investigated using HFE principles or framework

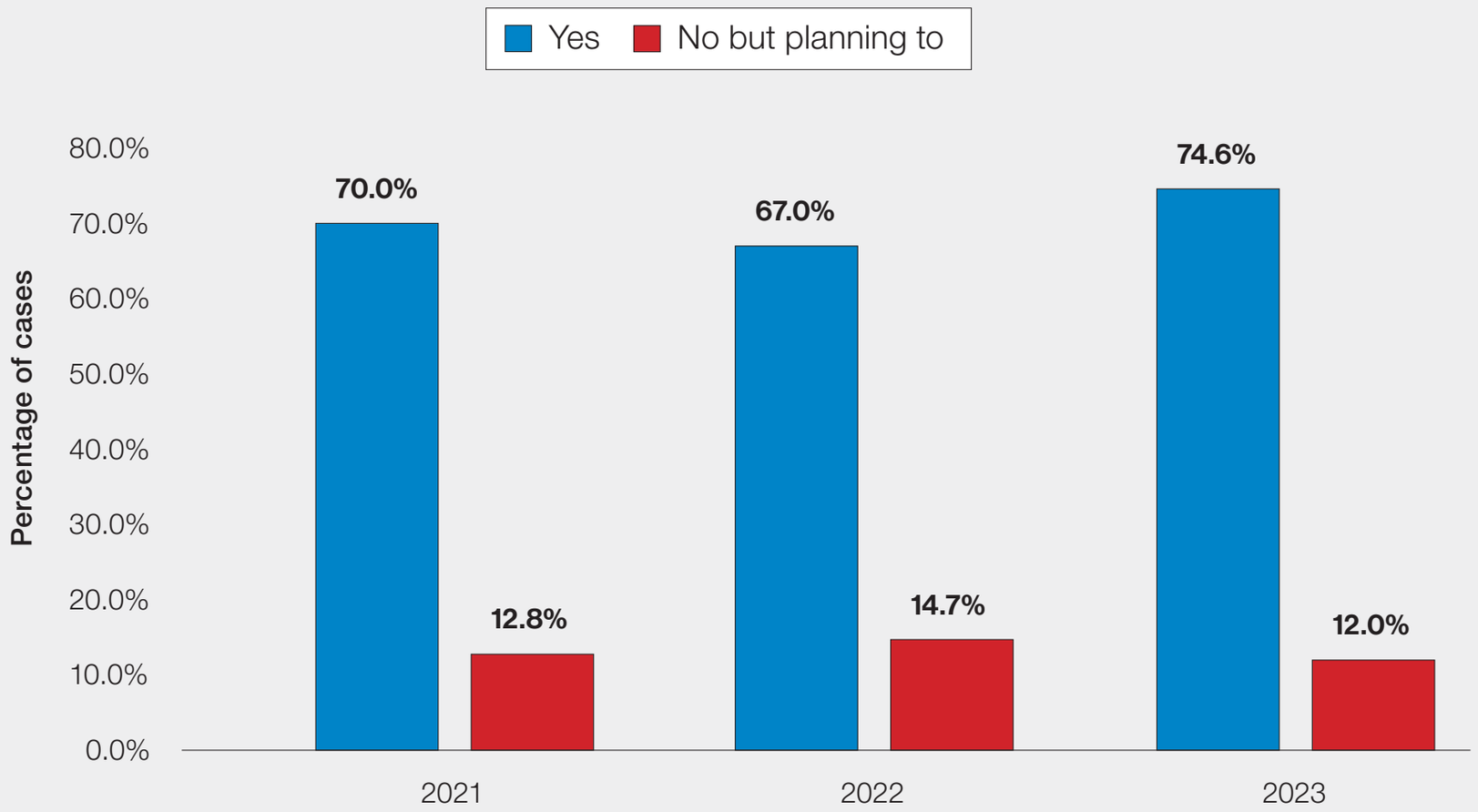
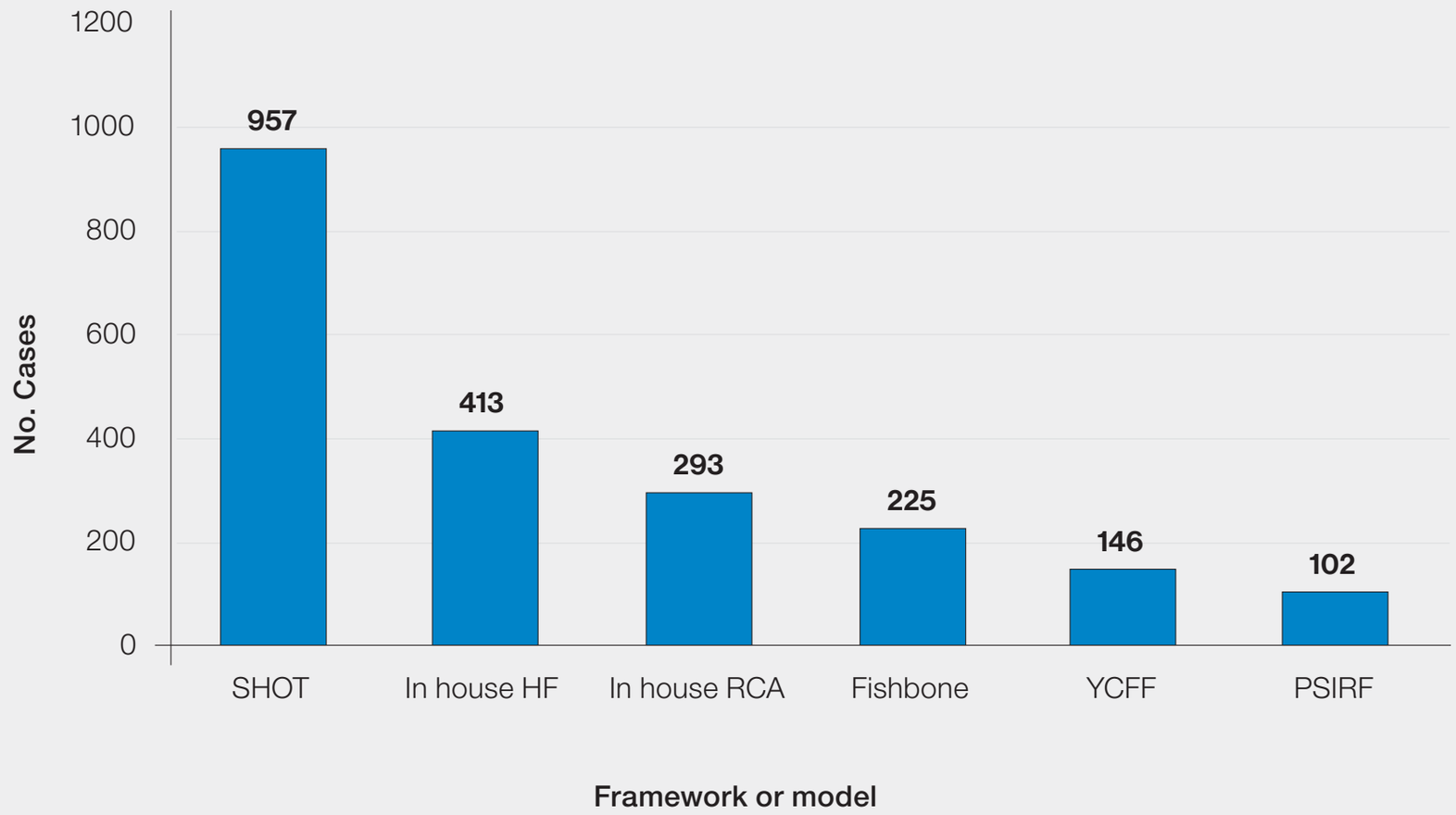
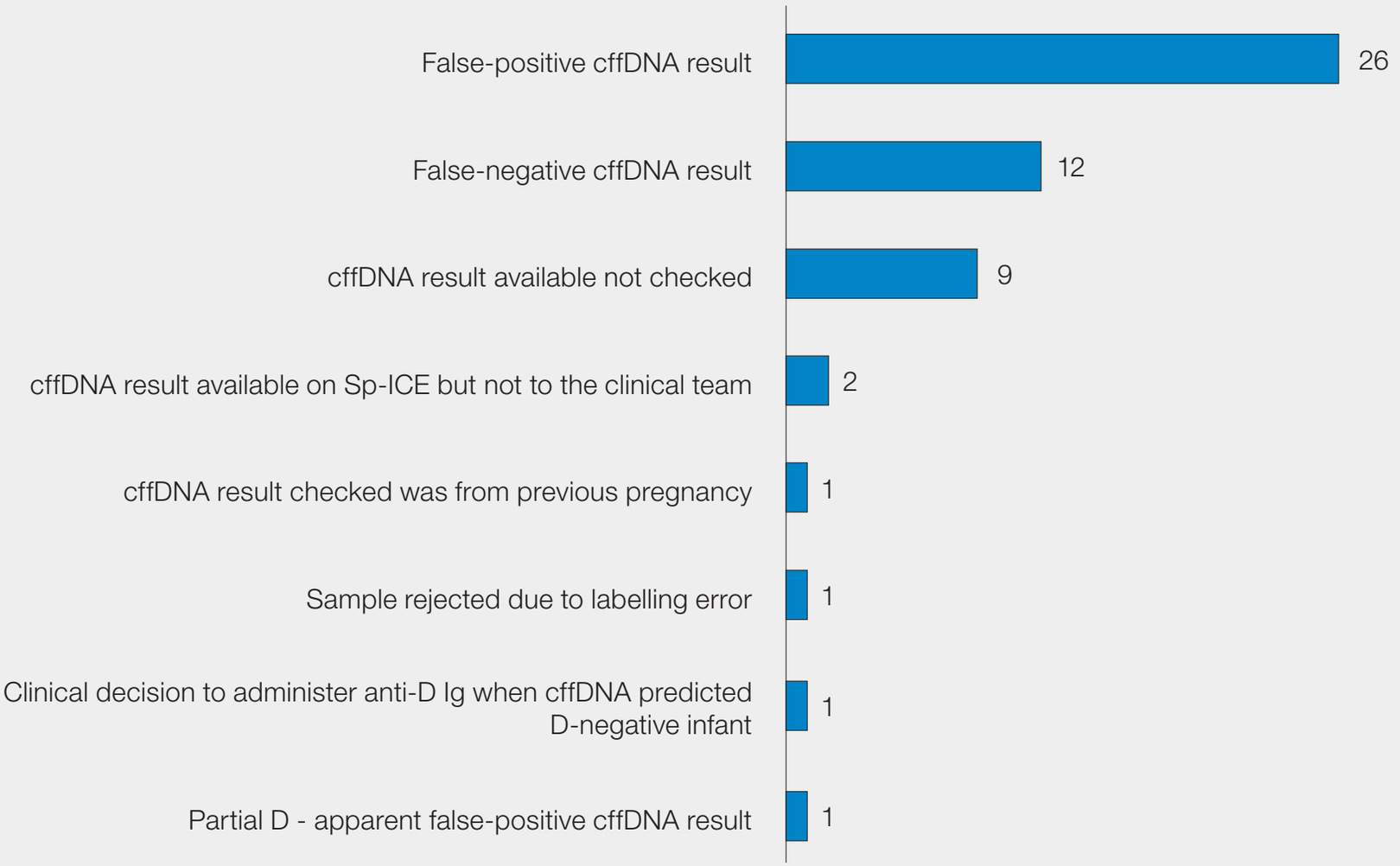


Figure 8.3: Top six human factors frameworks used for incident investigation as submitted by SHOT reporters in 2023



HF=human factors; PSIRF= Patient Safety Incident Response Framework; RCA=root cause analysis; YCFF=Yorkshire Contributory Factors Framework

Figure 9.1: Number and breakdown of cases related to non-invasive prenatal screening for RHD (n=53)



cffDNA=cell free fetal deoxyribonucleic acid; Ig=immunoglobulin; Sp-ICE=Specialist Services Integrated Clinical Environment

Figure 10.1: Overview of reports where an incorrect blood component was transfused in 2023 (n=356)

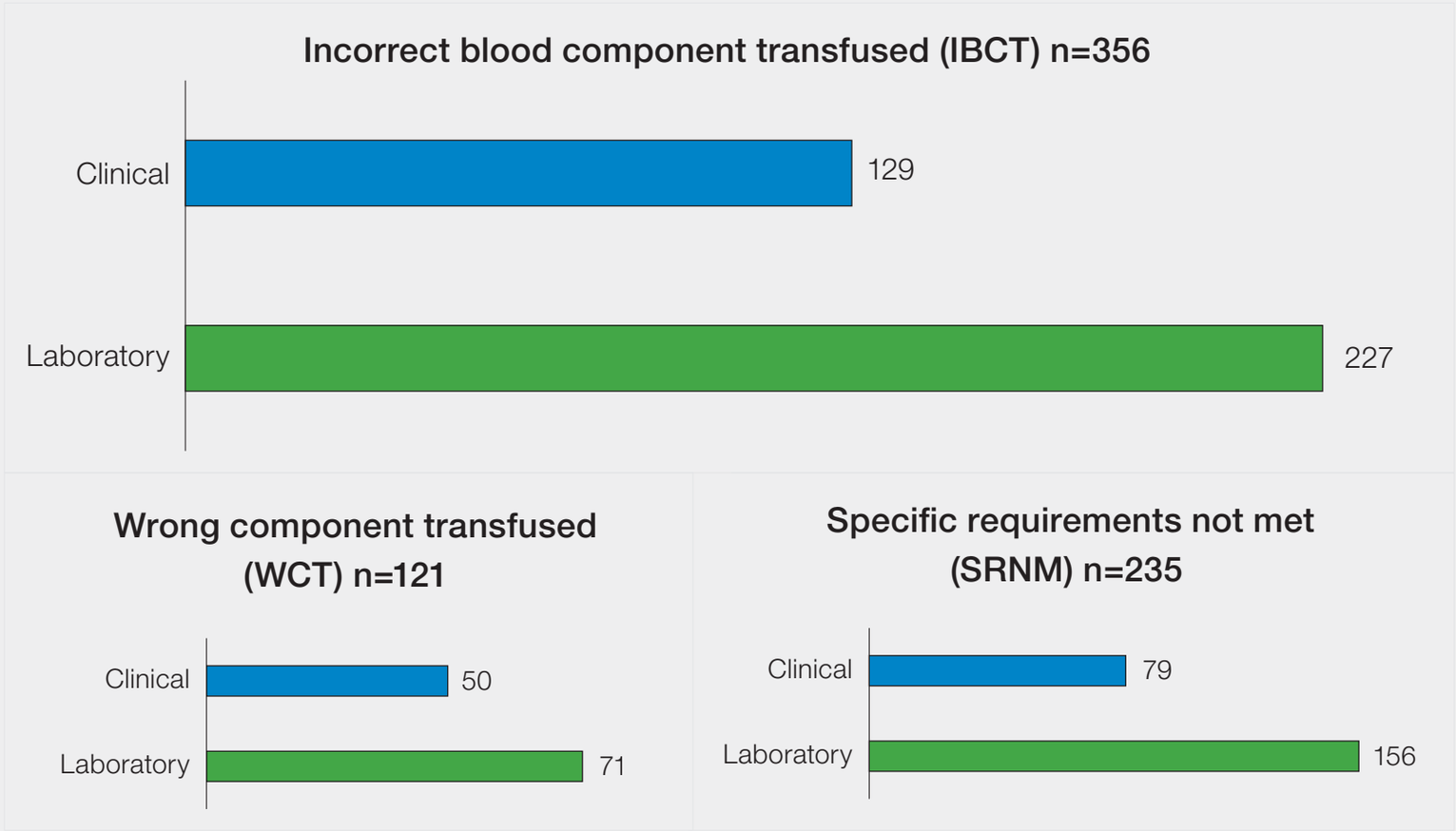
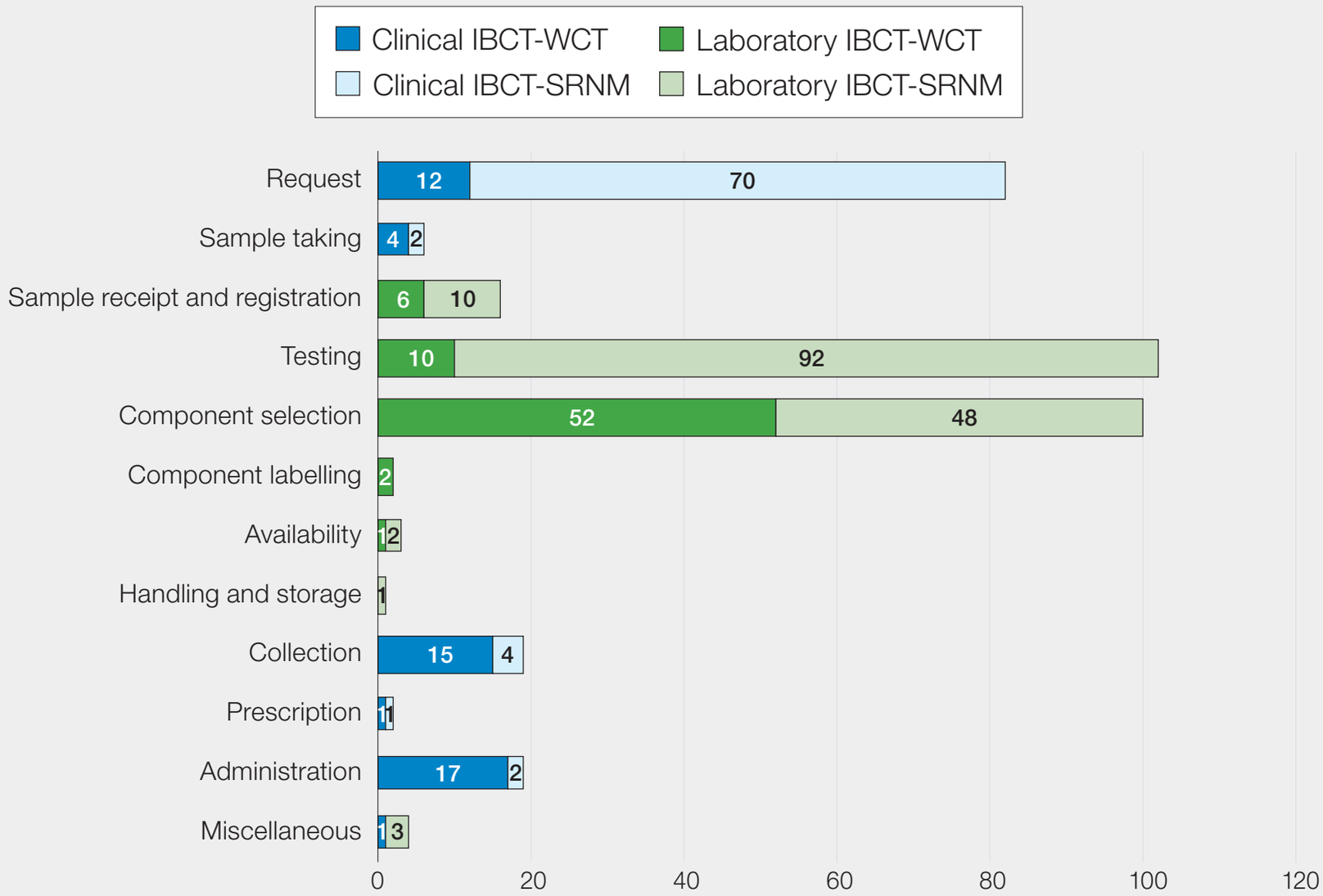


Figure 10.2: Total IBCT errors categorised by the step in the transfusion process where the error occurred (n=356)



IBCT-SRNM=incorrect blood component transfused-specific requirements not met; IBCT-WCT=IBCT-wrong component transfused

Figure 10.3: Categorisation of clinical IBCT-WCT errors by step where the primary error occurred (n=50)

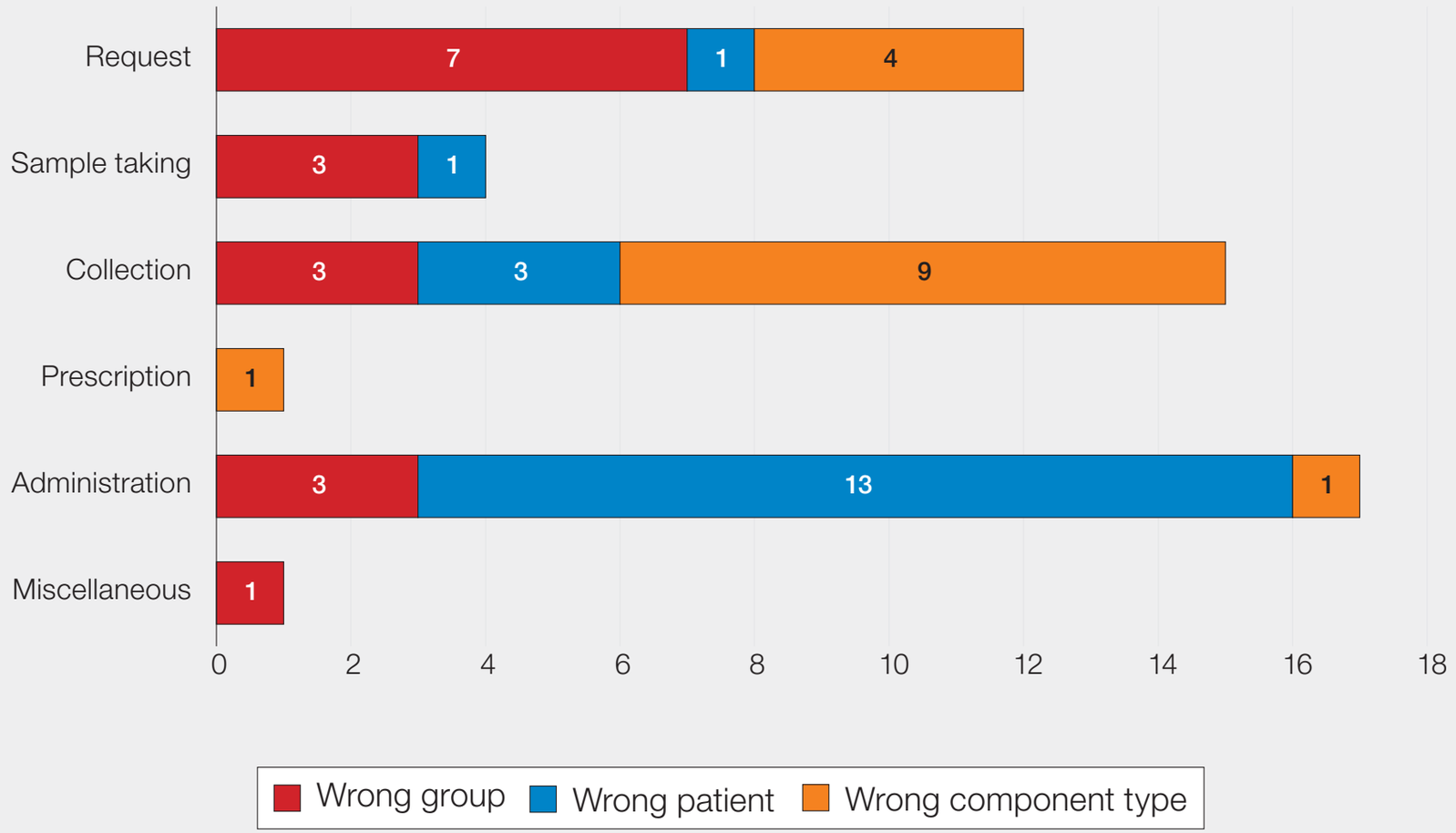
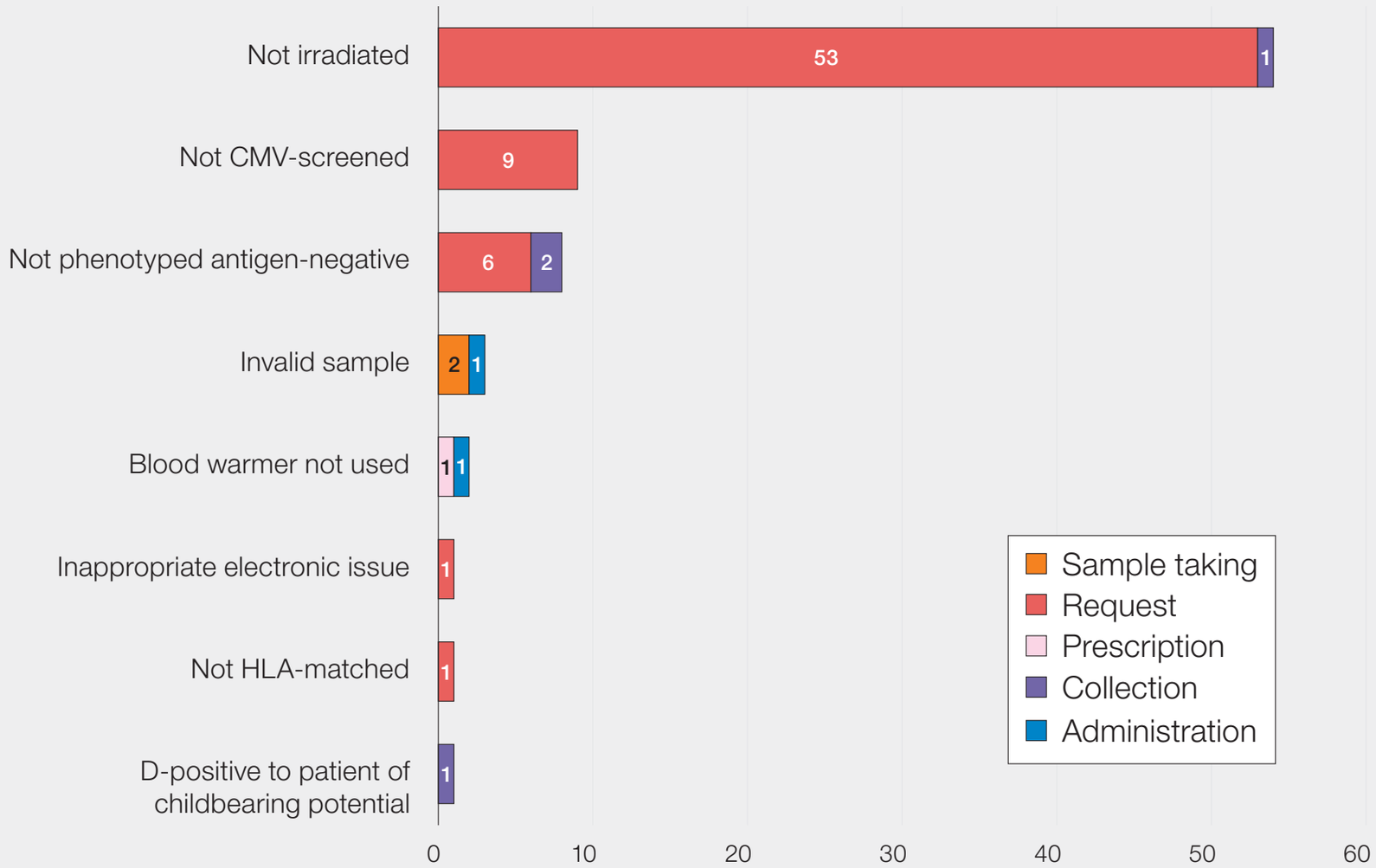


Figure 10.4: Clinical IBCT-SRNM errors and transfusion step where the error occurred (n=79)



CMV=cytomegalovirus; HLA=human leucocyte antigen

Figure 10.5: Laboratory IBCT-WCT errors by transfusion step (n=71)

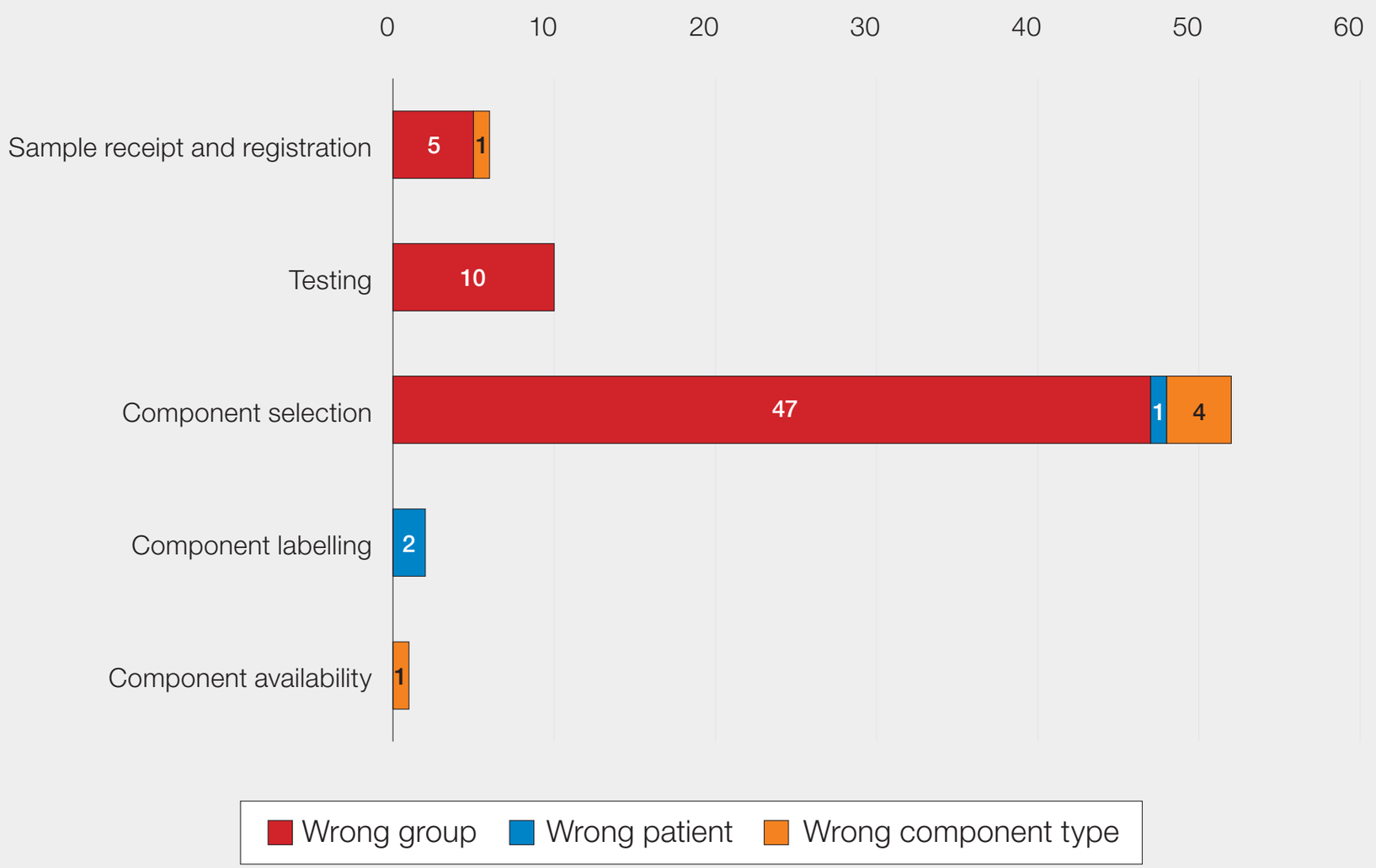


Figure 10.6: Laboratory IBCT-WCT error by category (n=71)

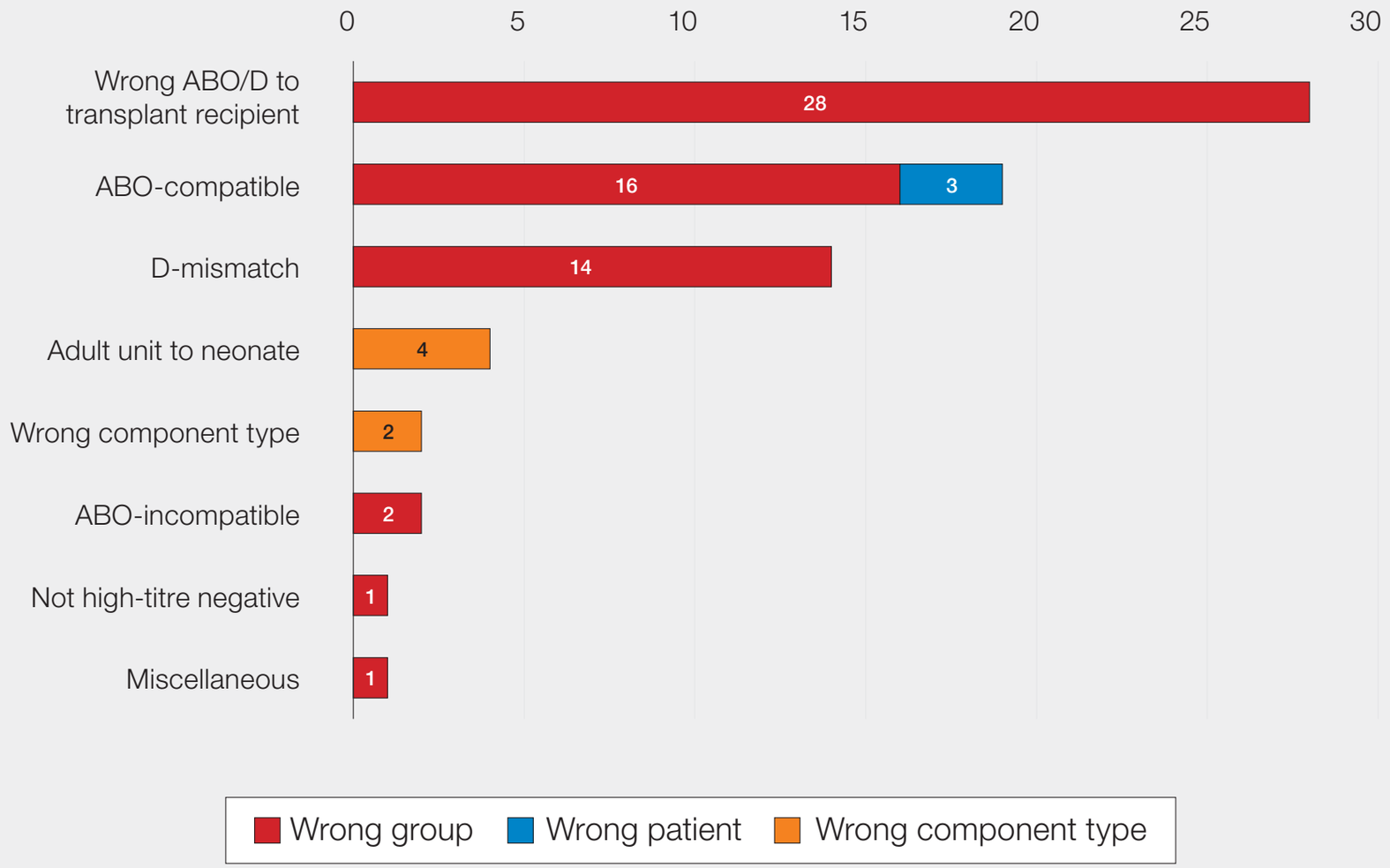
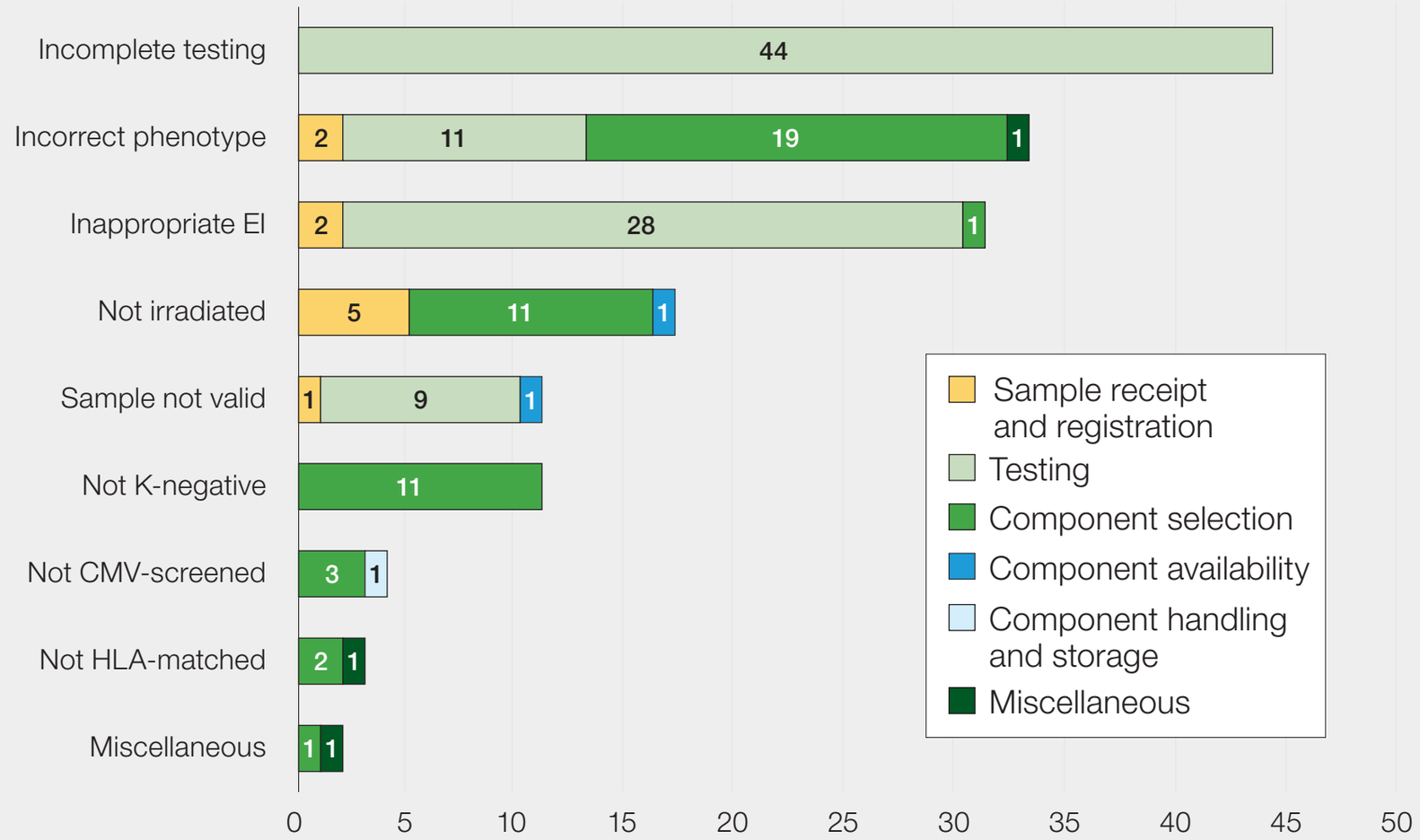


Figure 10.7: Laboratory IBCT-SRNM errors by transfusion step (n=156)



EI=electronic issue; HLA=human leucocyte antigen; CMV=cytomegalovirus

Figure 10.8: Contributory factors for IBCT errors in 2023

Gaps in staff training and knowledge

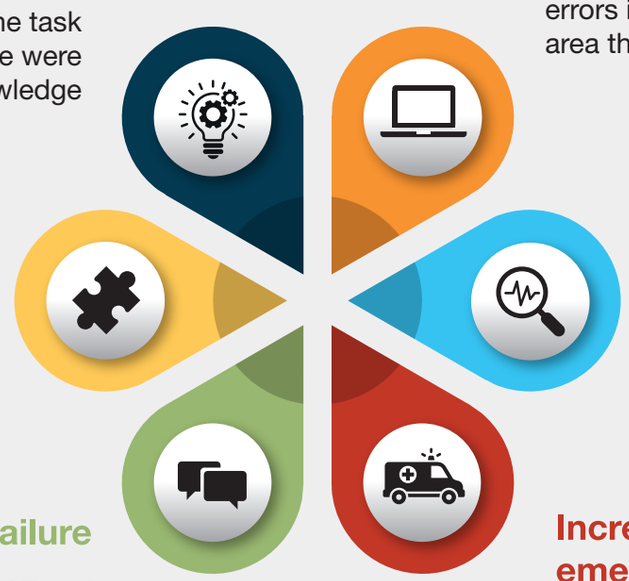
Over 80% of errors occurred when staff member was deemed competency-assessed for the task
Over 20% occurred when there were gaps in staff skills or knowledge

IT issues

In the laboratory over 75% of errors involved IT. In the clinical area this was over 60%

Staff and skill mix

In both the laboratory and clinical areas over 28% of reports mention staffing and skill mix issues. In the laboratory just under 50% of errors occurred when the member of staff was lone working



Suboptimal safety checks

Over 75% of clinical errors occurred despite the use of a pre-administration checklist. In the laboratory over 65% of errors occurred despite the use of a component labelling and exit check being used

Communication failure

In nearly 50% of all IBCT-WCT and IBCT-SRNM reports a breakdown in communication was implicated

Increased pressure in emergency situations

Over 30% of laboratory errors involved emergency or urgent transfusions. This was 57% in clinical areas

Figure 11.1: Breakdown of 2023 handling and storage error (HSE) reports (n=342)

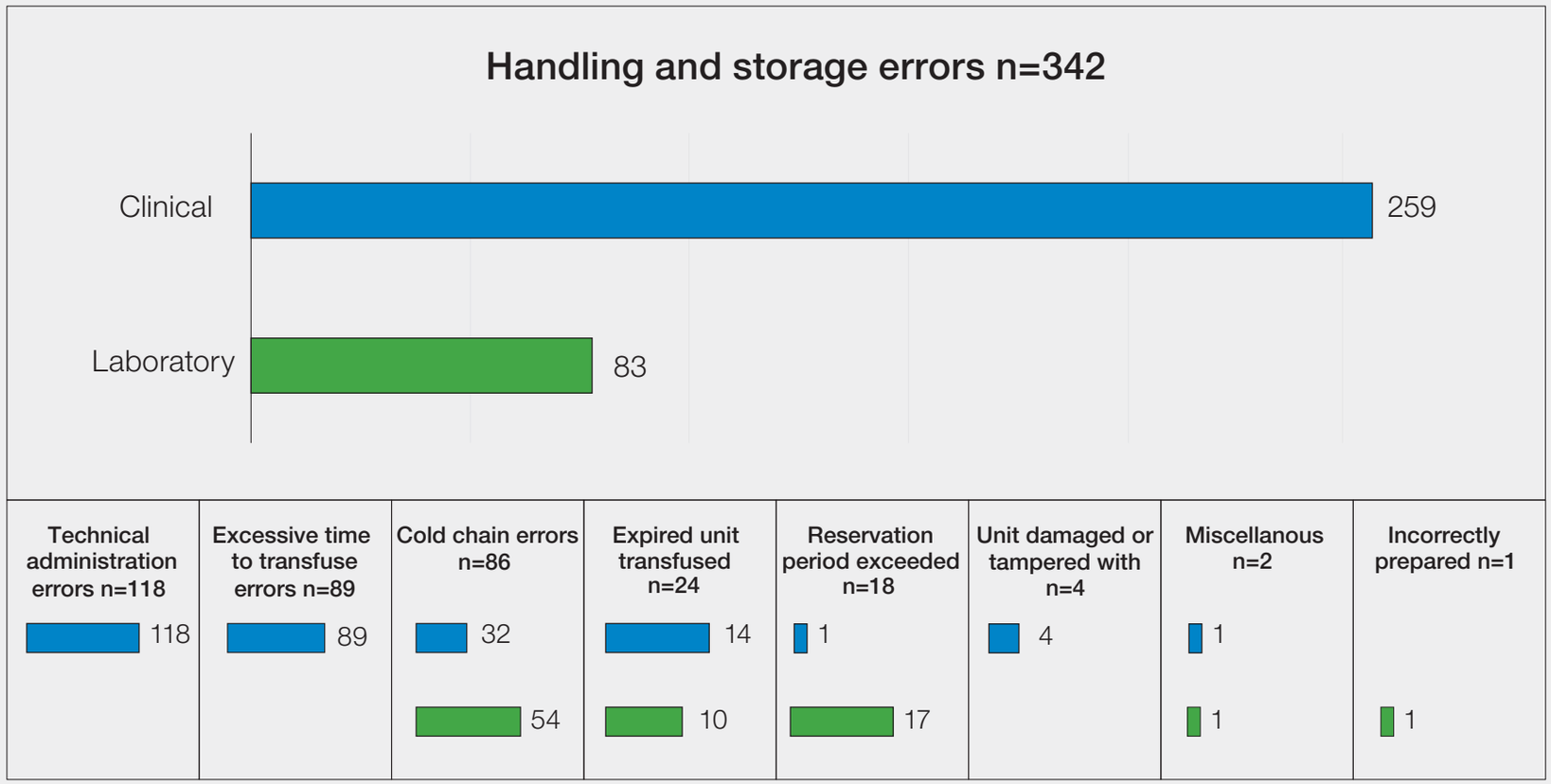
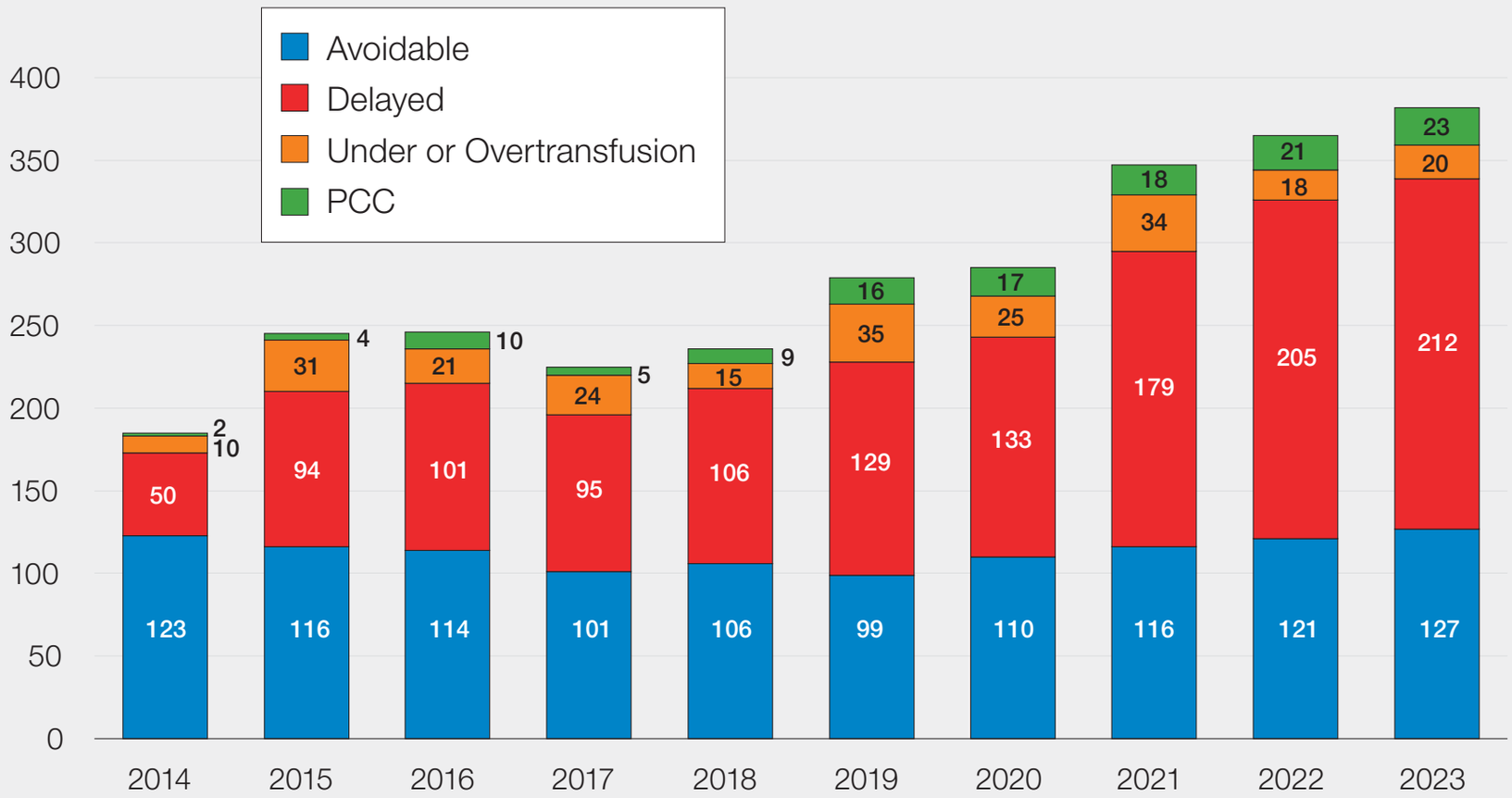


Figure 12.1: ADU reports by category 2014-2023



PCC=prothrombin complex concentrates

Figure 12a.1: Delayed transfusions by year 2011-2023

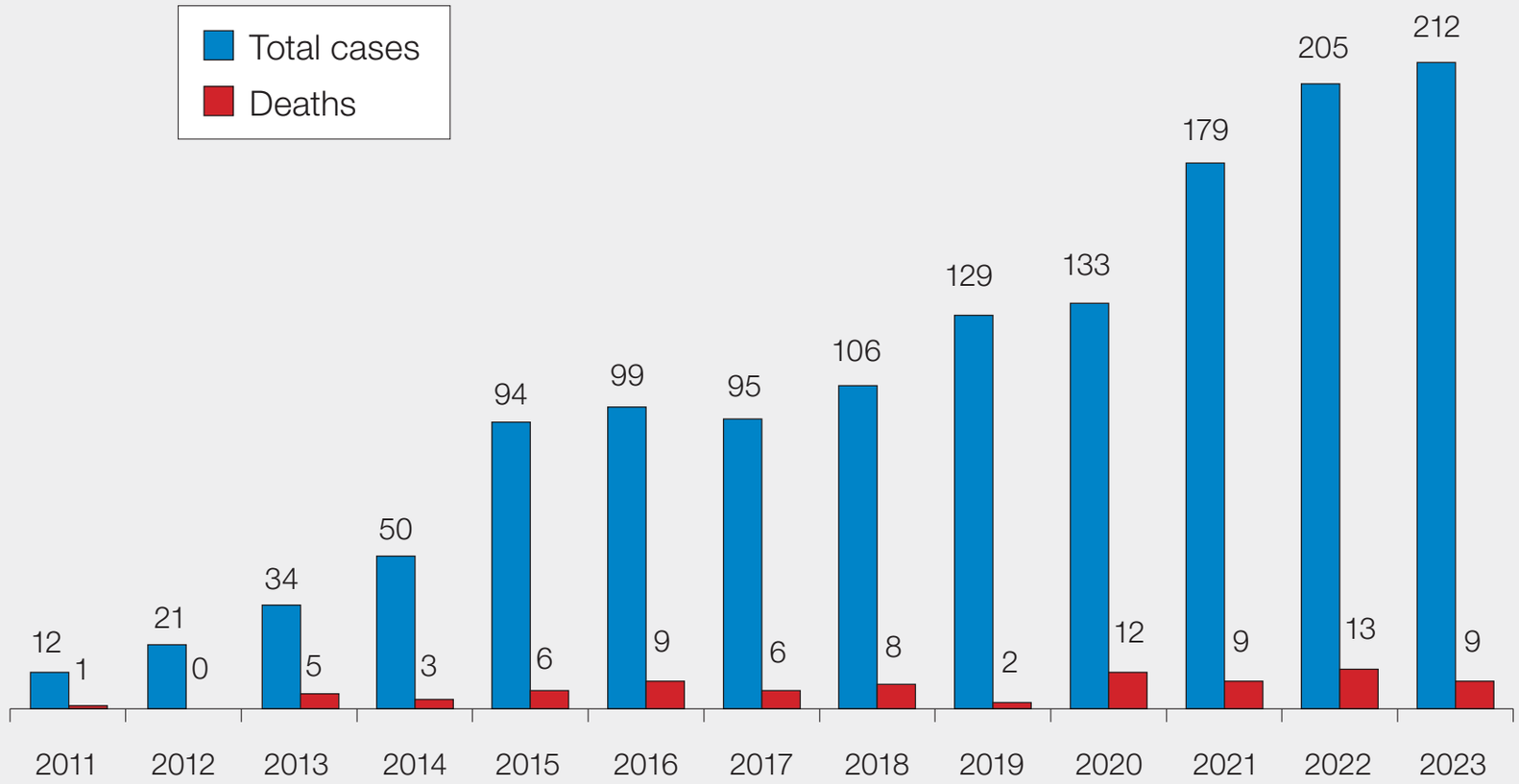


Figure 12a.2: Number of delayed transfusions associated with MHP 2016-2023

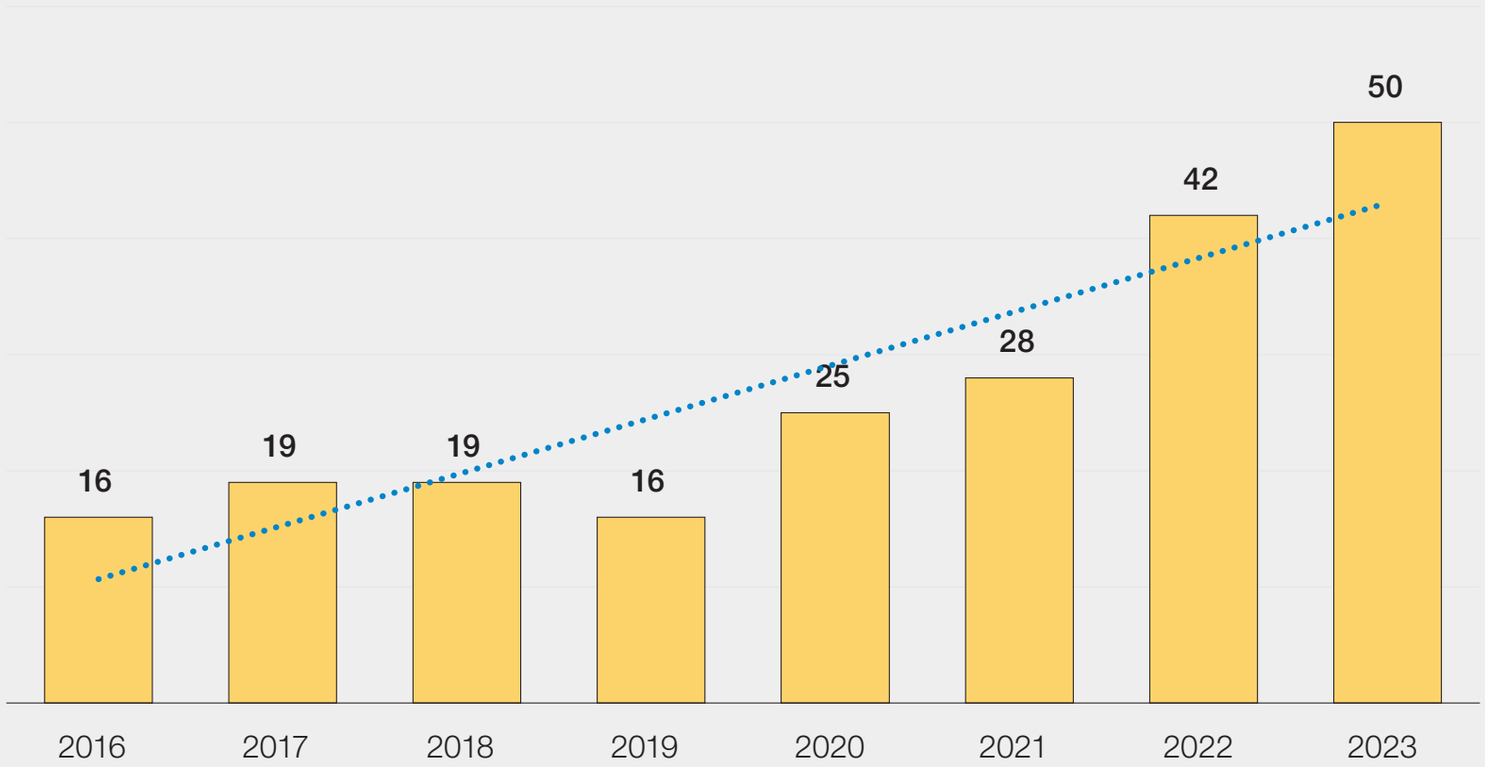


Figure 12a.3: Key factors contributing to delayed transfusions in major haemorrhage in 2023 (n=50)

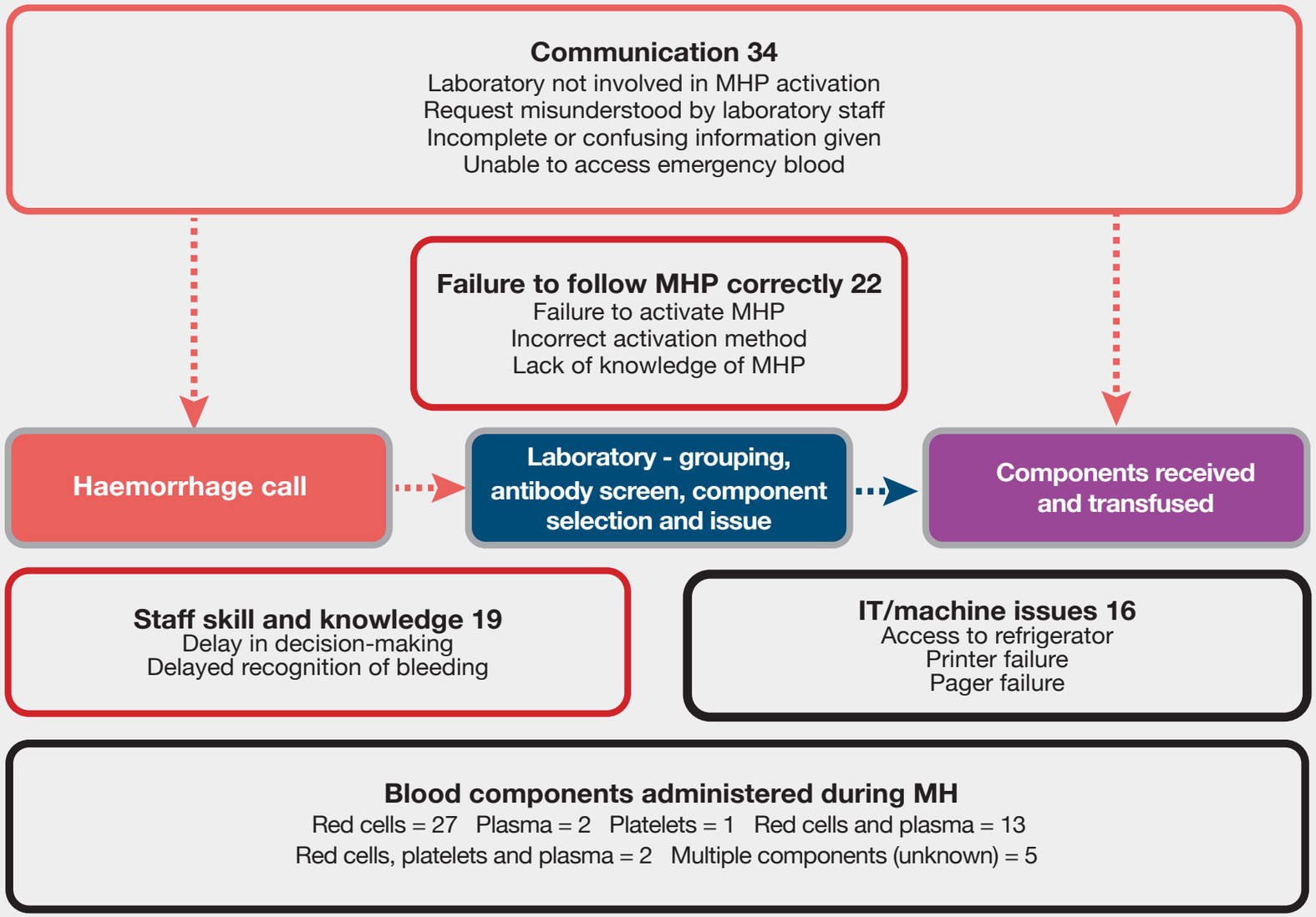
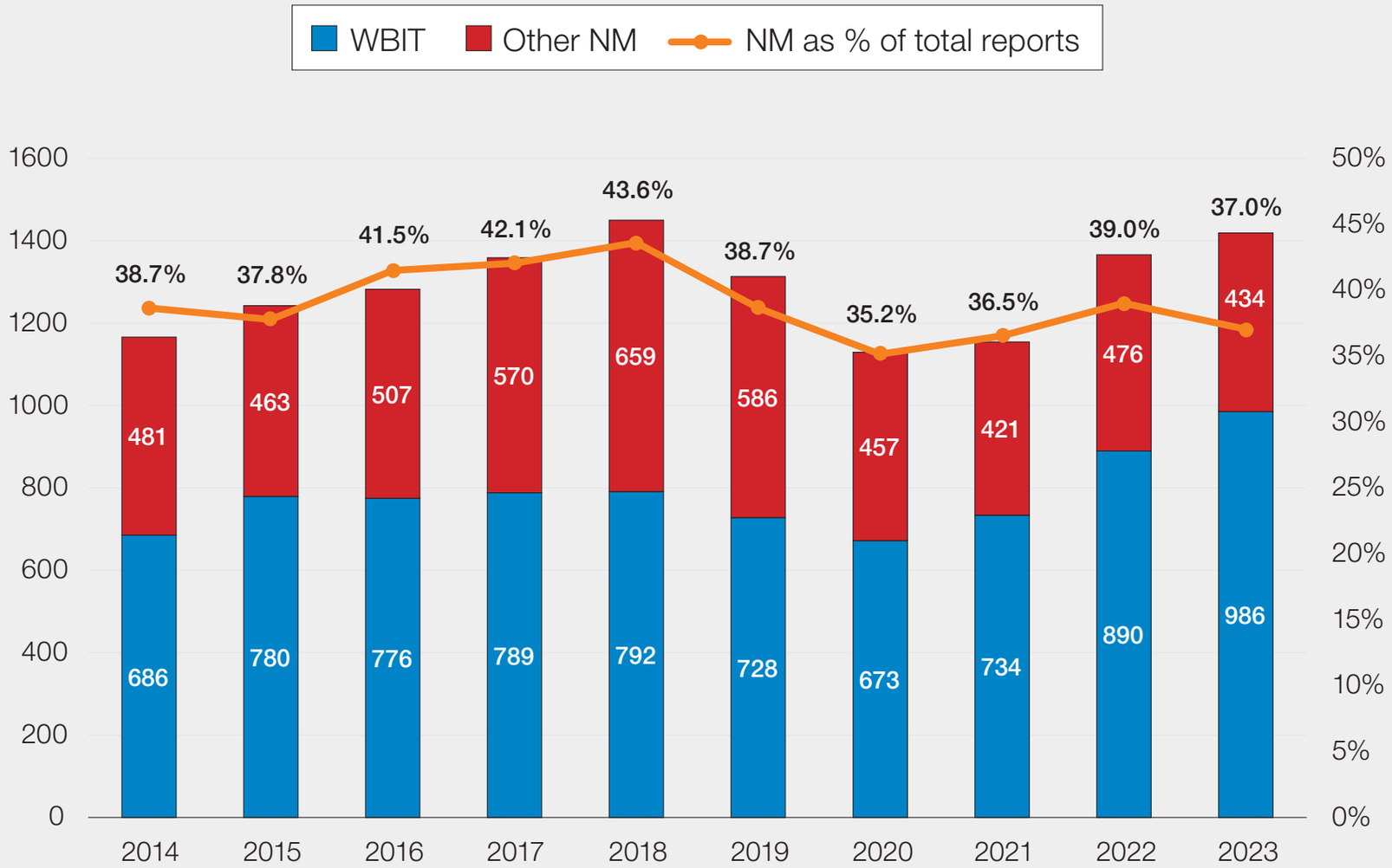


Figure 13.1: A decade of NM and WBIT reports 2014-2023



NM=near miss; WBIT=wrong blood in tube

Figure 13a.1: Primary errors leading to WBIT in 2023 (n=986)

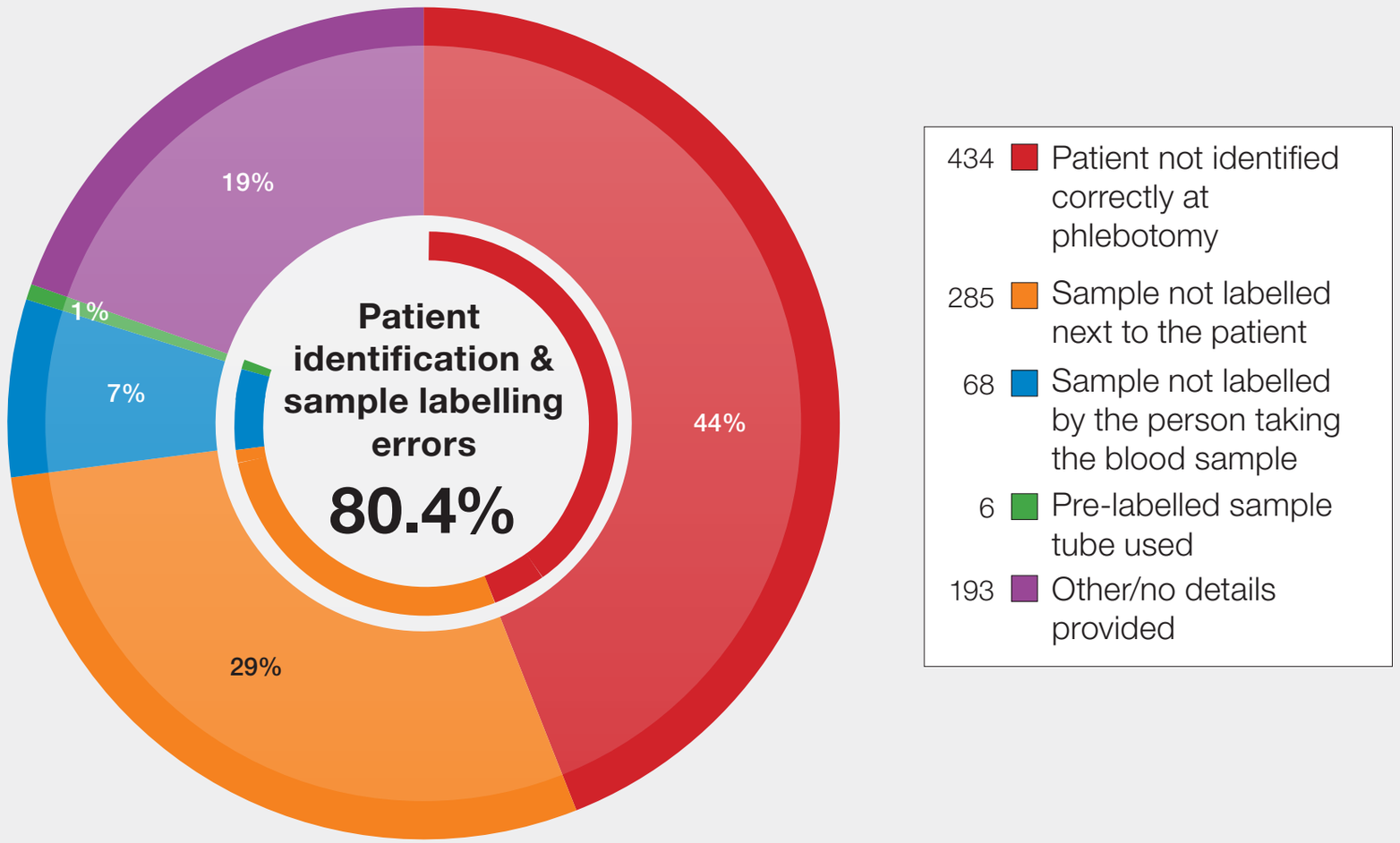


Figure 13a.1: Primary errors leading to WBIT in 2023 (n=986)

Figure 13a.2: Point in the process where the error was detected in WBIT reported in 2023 (n=986)

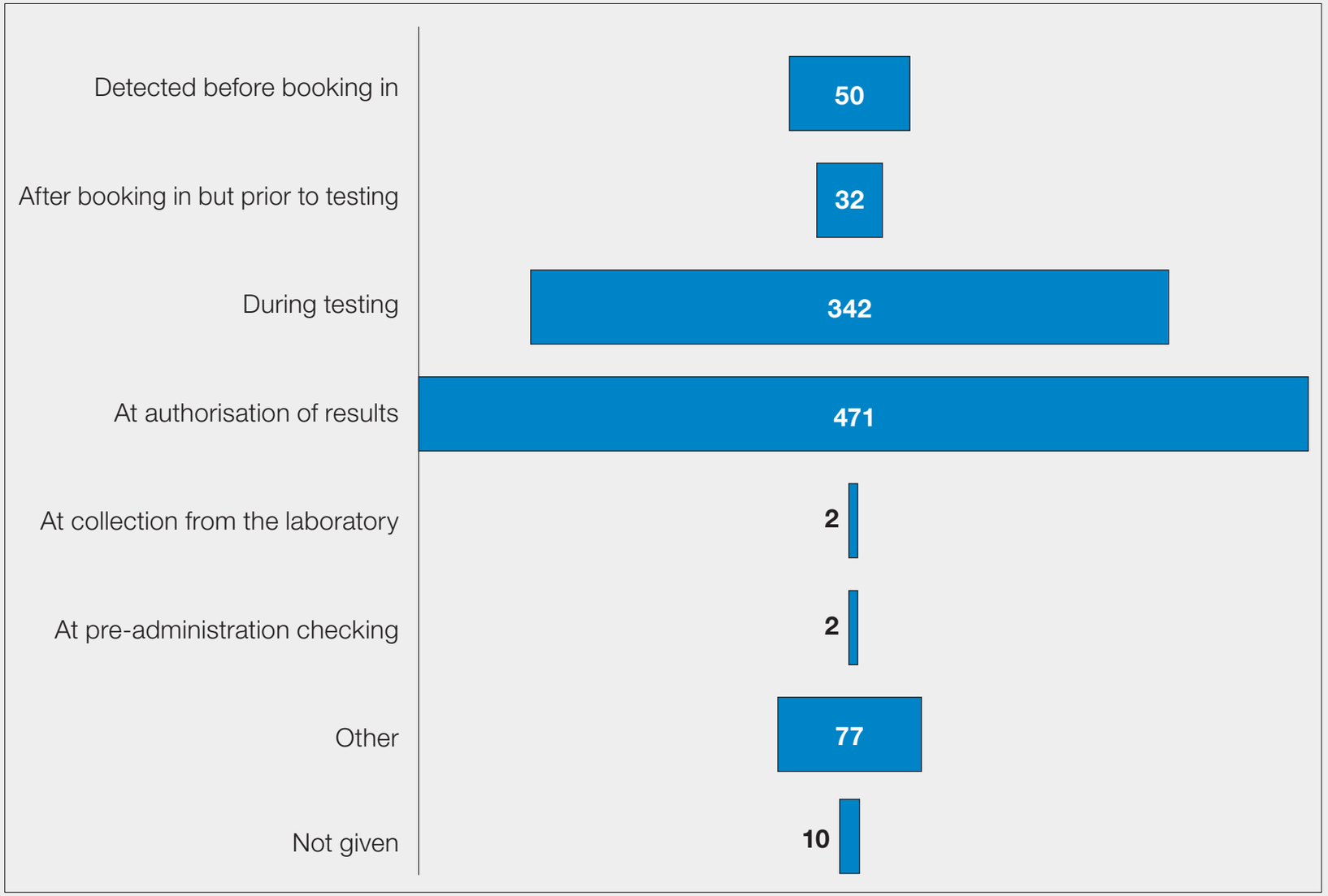


Figure 13a.3: Numbers of different healthcare professionals who took blood samples resulting in WBIT in 2023 (n=986)

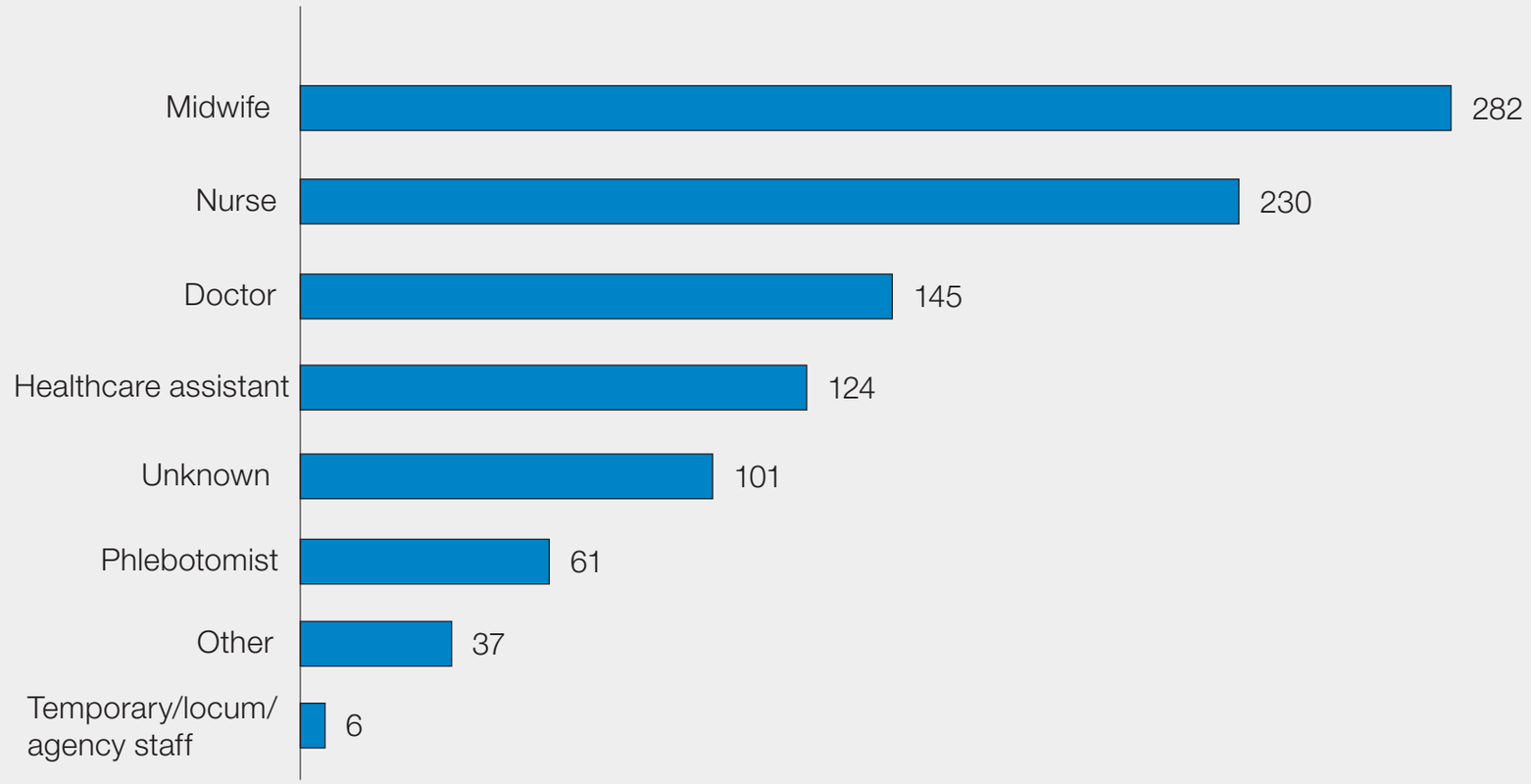


Figure 14.1: Breakdown of RBRP reports in 2023 (n=259)

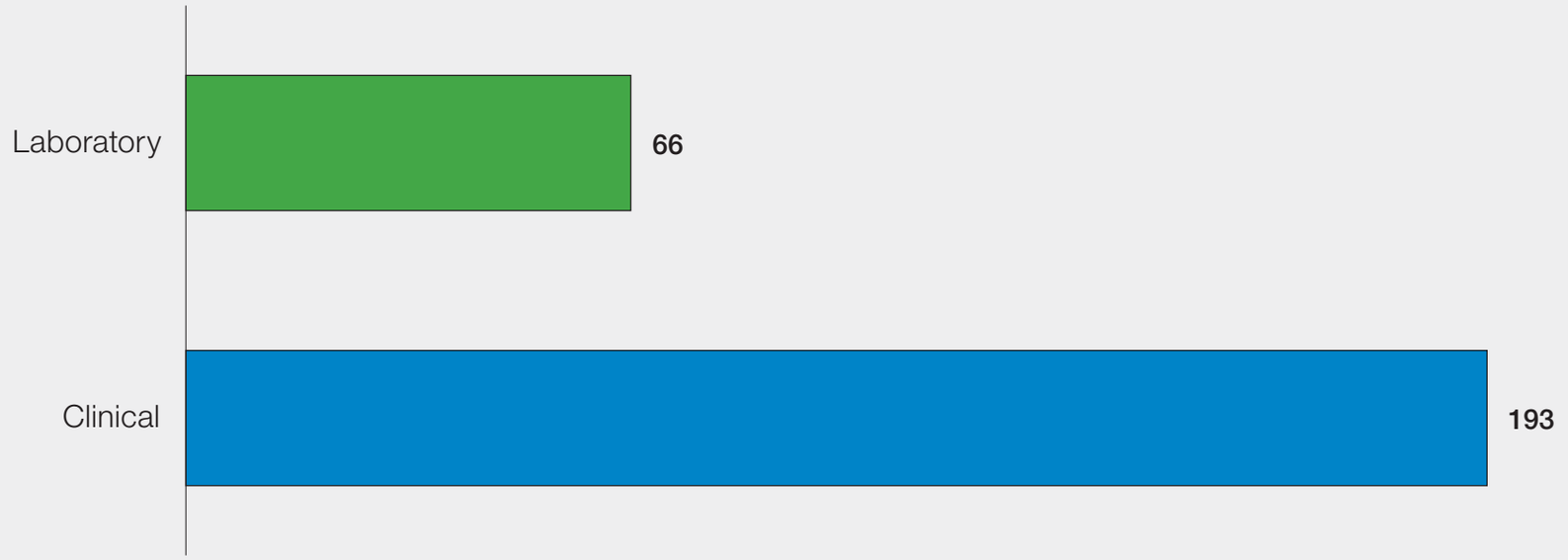


Figure 14.2: RBRP classified by the step in the transfusion process where the primary error occurred in 2023 (n=259)

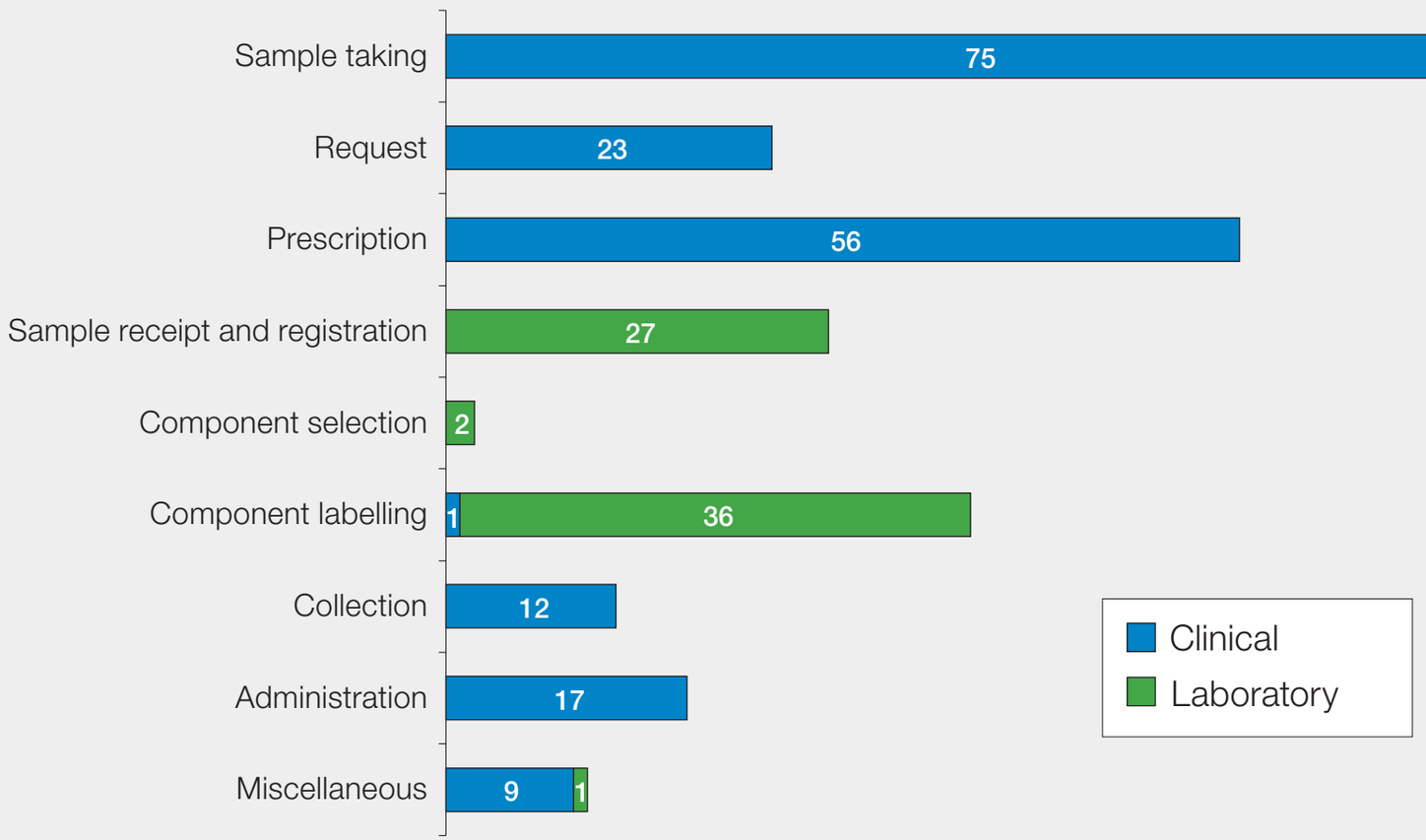


Figure 14.3: Contributory factors in RBRP errors reported in 2023 (n=259)

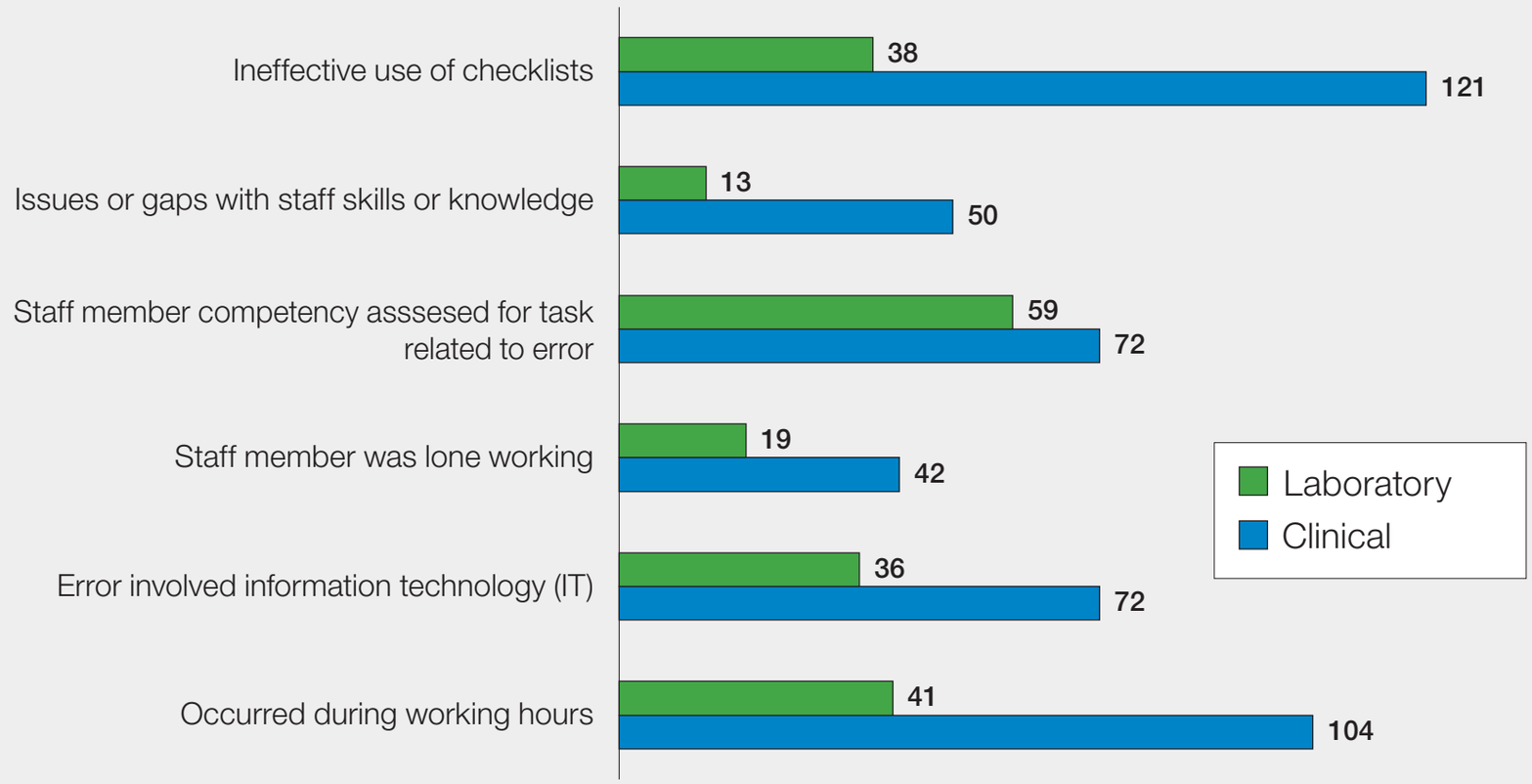
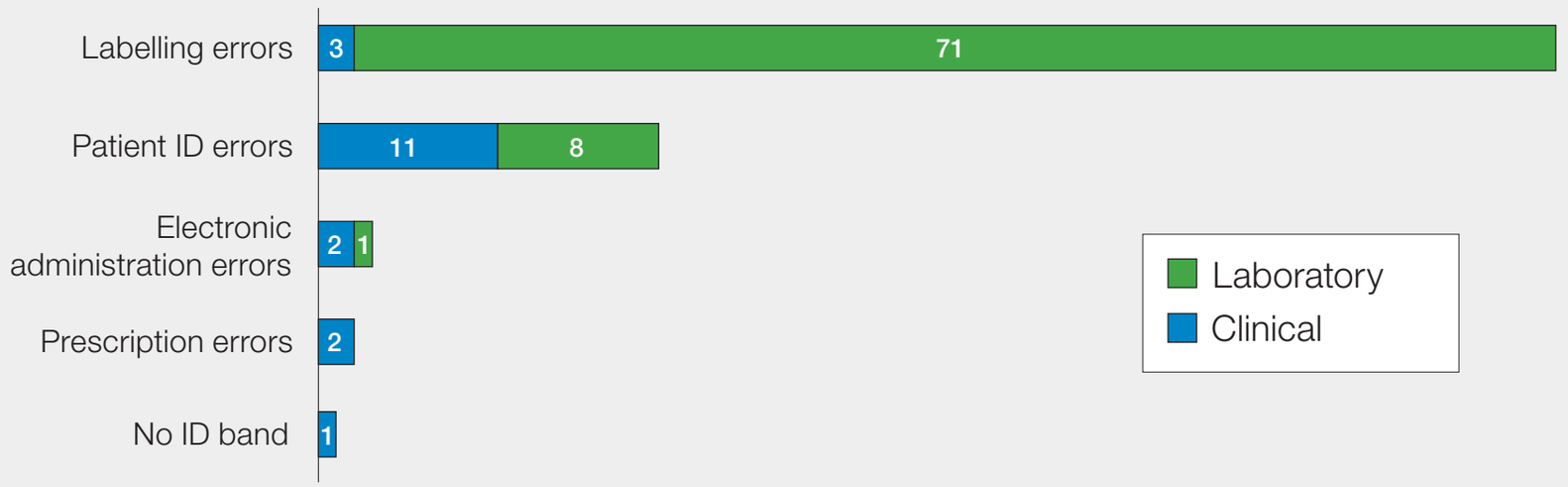
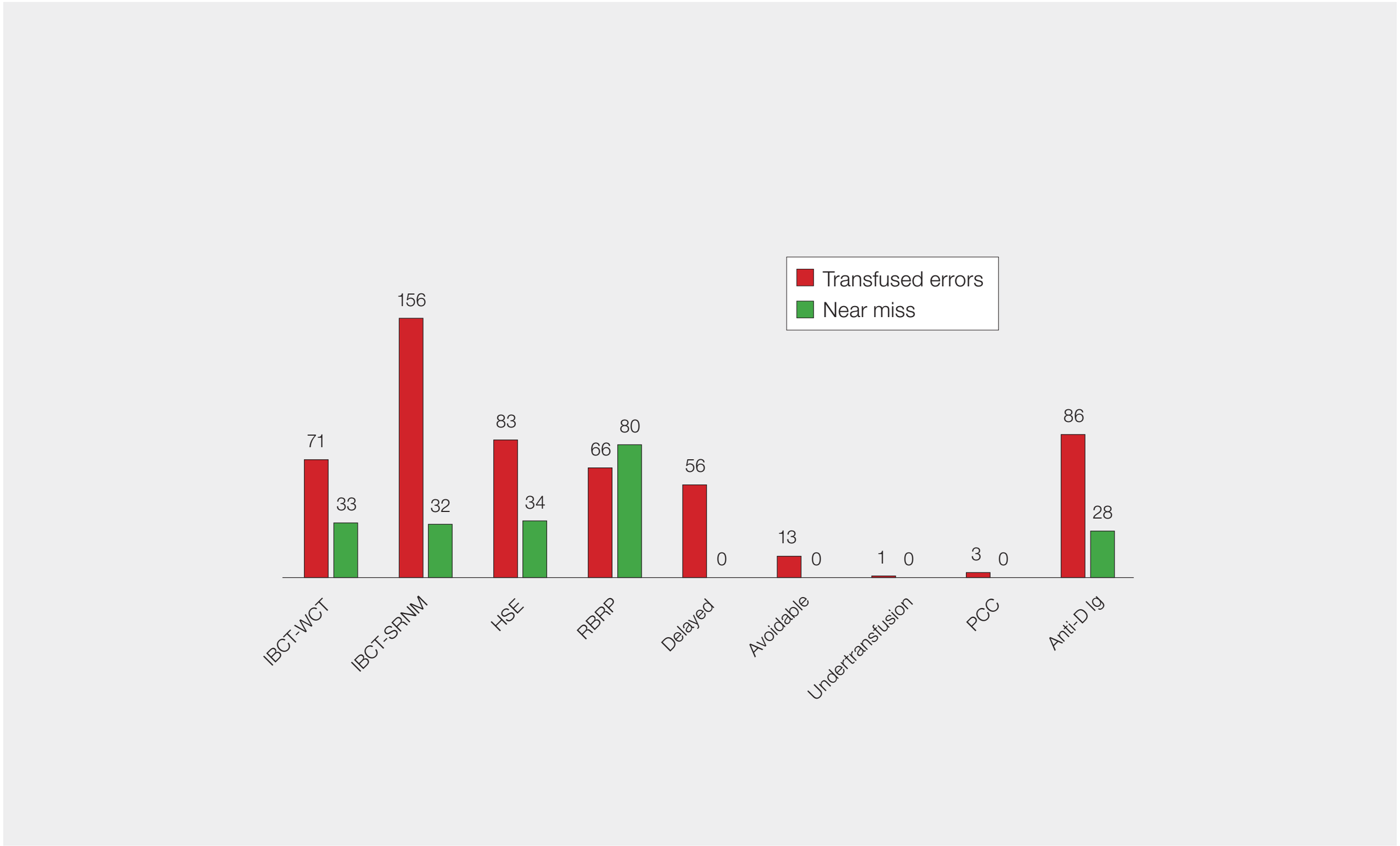


Figure 14.4: RBRP near miss events in 2023 by subcategory for clinical and laboratory errors (n=99)



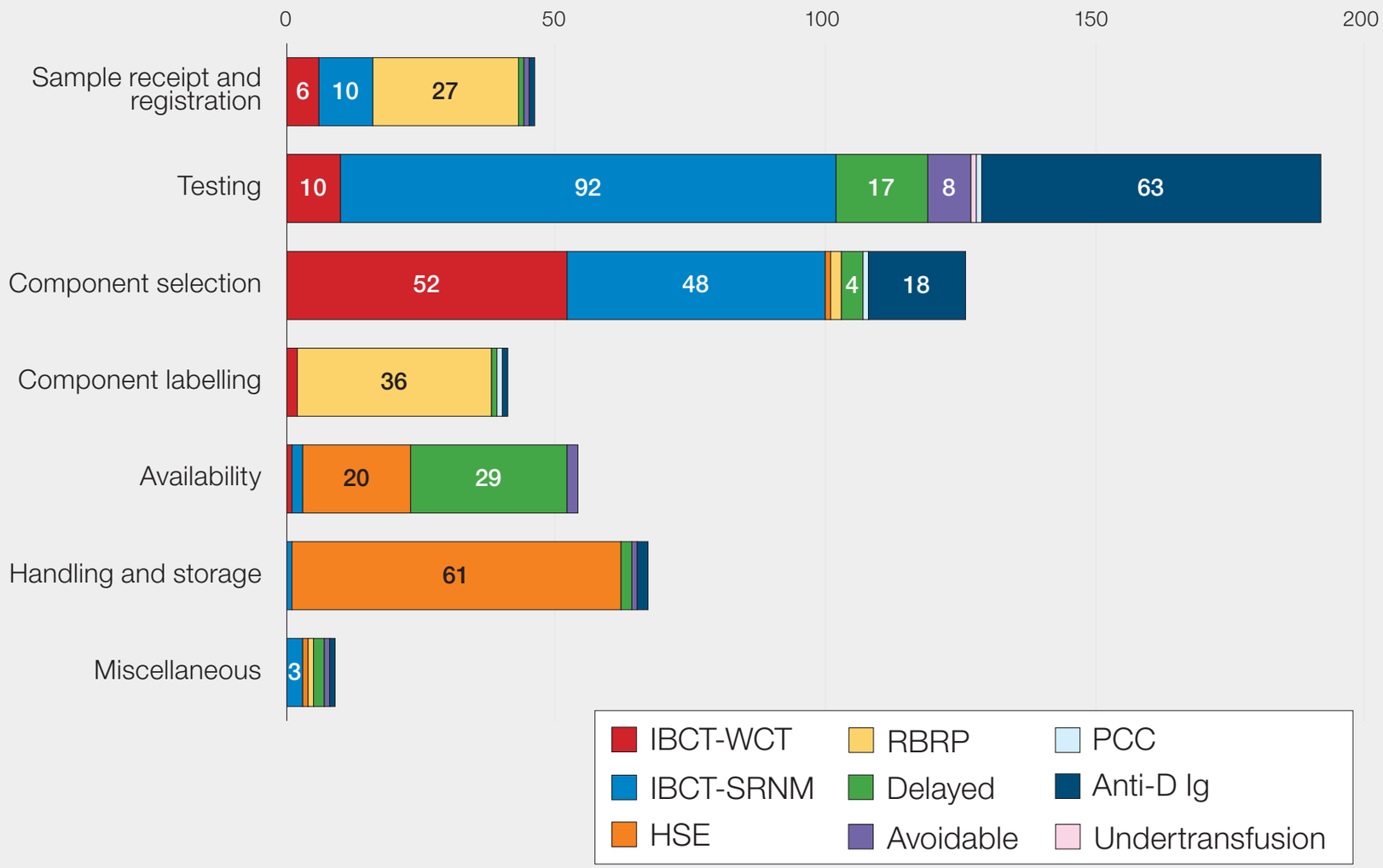
ID=identification

Figure 15.1: Laboratory errors and near misses by reporting category in 2023 (n=742)



IBCT-WCT=incorrect blood component transfused-wrong component transfused; IBCT-SRNM=IBCT-specific requirements not met; HSE=handling and storage errors; RBRP=right blood right patient; PCC=prothrombin complex concentrate; Ig=immunoglobulin

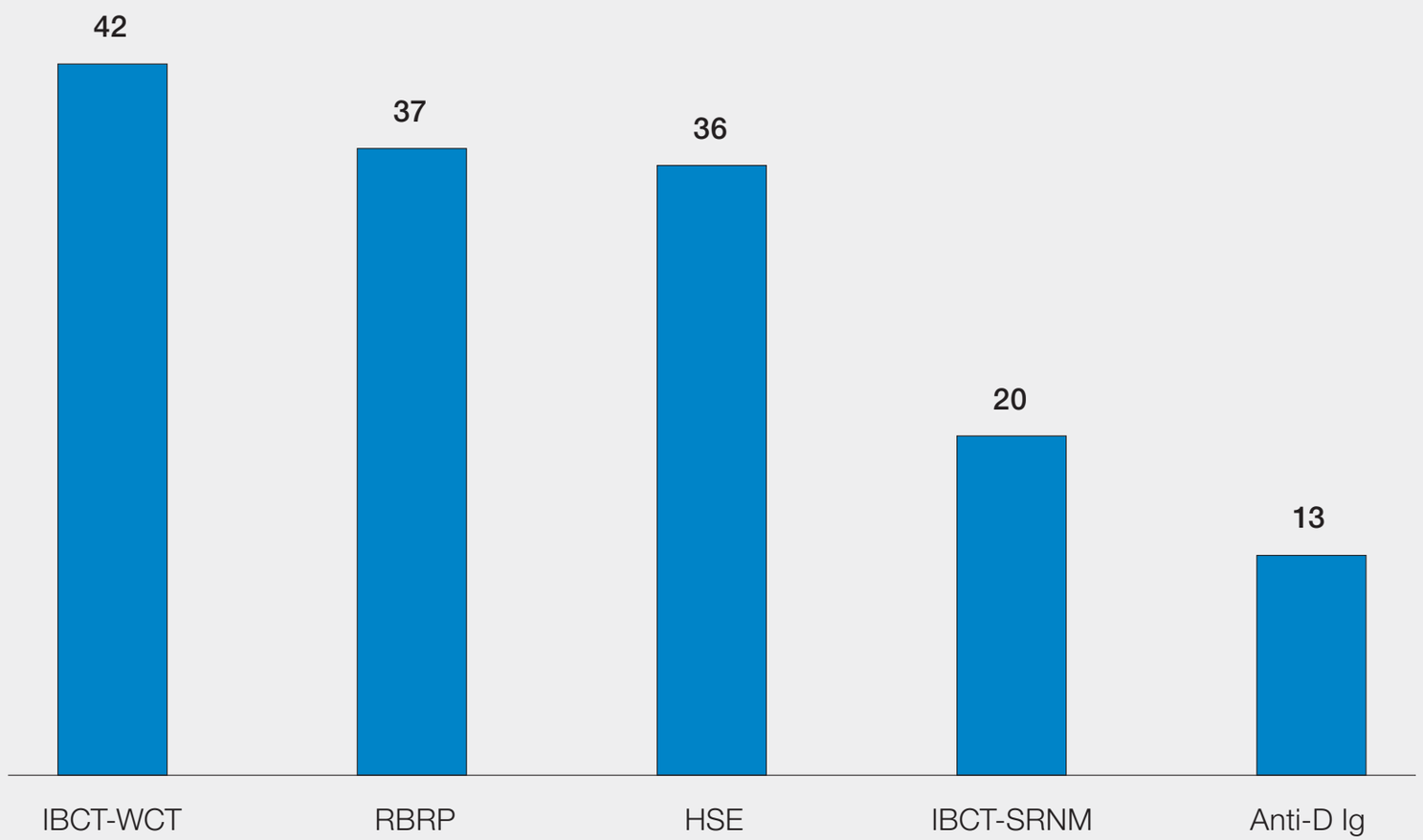
Figure 15.2: SHOT laboratory data across all categories showing the stage in the transfusion process where the primary error occurred (n=535)



IBCT-WCT=incorrect blood component transfused-wrong component transfused; IBCT-SRNM=IBCT-specific requirements not met; HSE=handling and storage errors; RBRP=right blood right patient; PCC=prothrombin complex concentrate; Ig=immunoglobulin Note: numbers <3 are too small to be annotated on the figure

Figure 15.3: Additional pressures on transfusion laboratories evident in 2023 SHOT data

Figure 16.1: Near miss events related to IT by SHOT reporting category in 2023 (n=148)



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

Figure 17.1: Proportion of reactions classified as severe 2019-2023

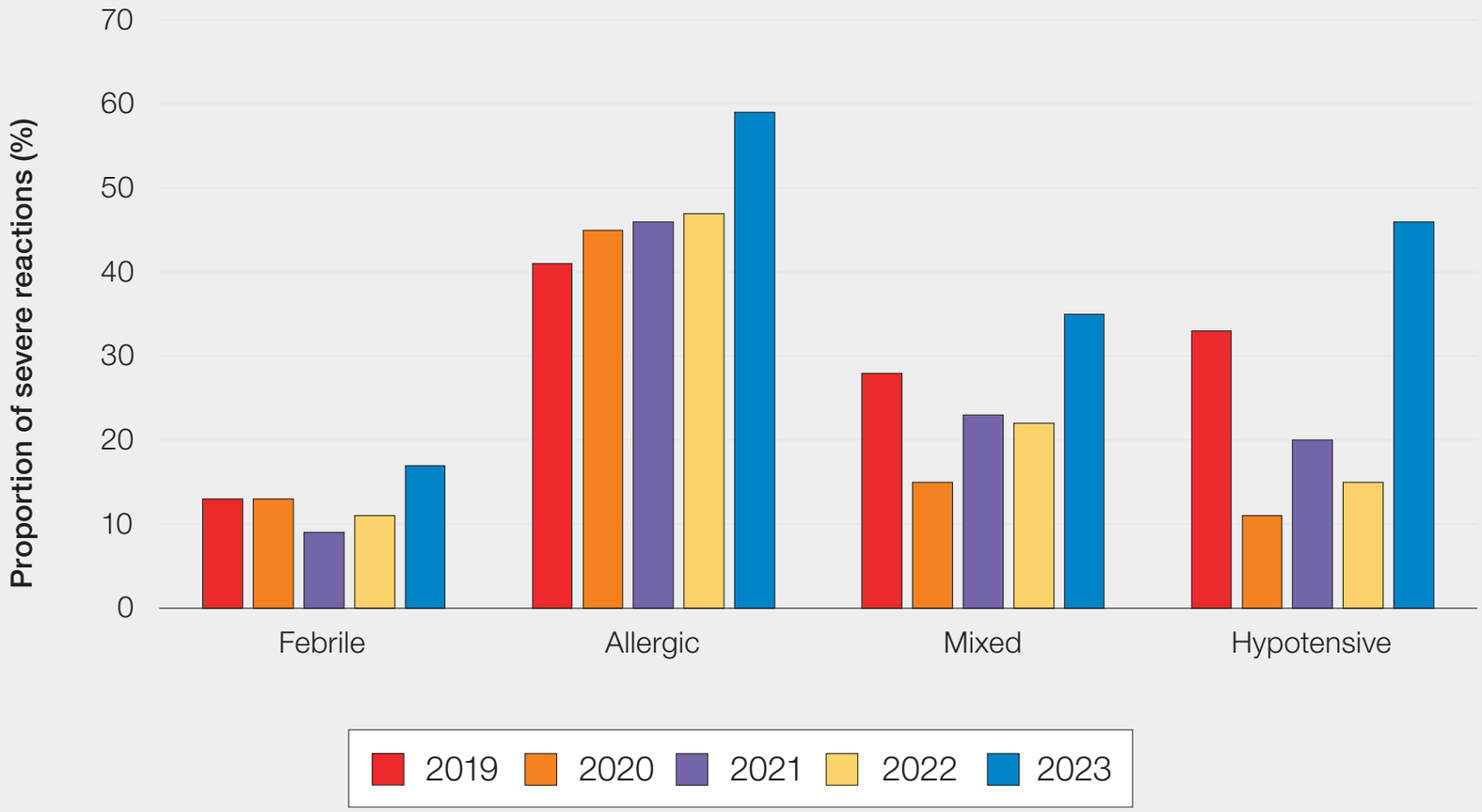
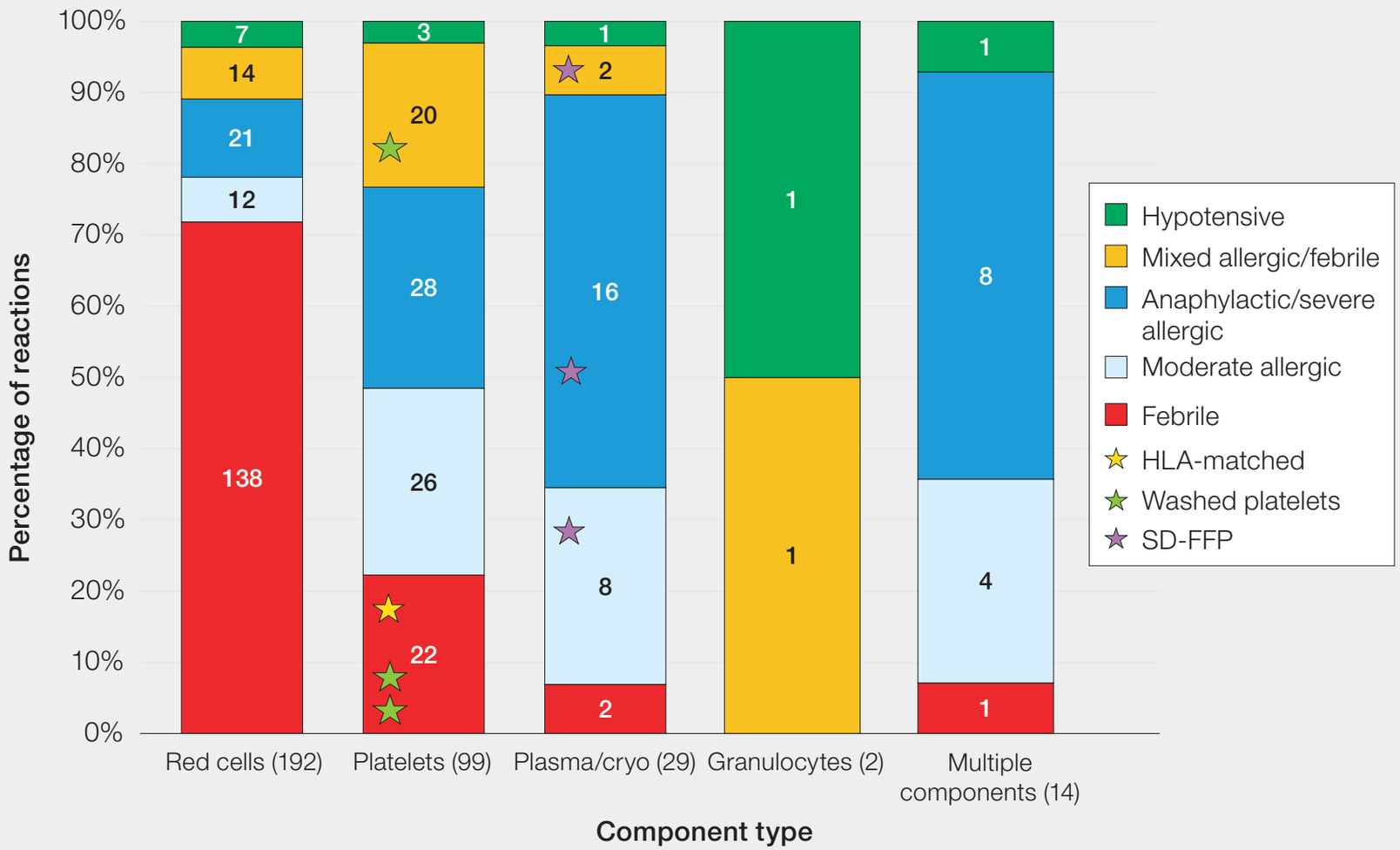


Figure 17.2: Reactions by component type in 2023 (n=336)



HLA=human leucocyte antigen; cryo=cryoprecipitate; SD-FFP=solvent detergent treated fresh frozen plasma

Figure 17.3: Incidence of reactions as a percentage of platelet units issued in 2023

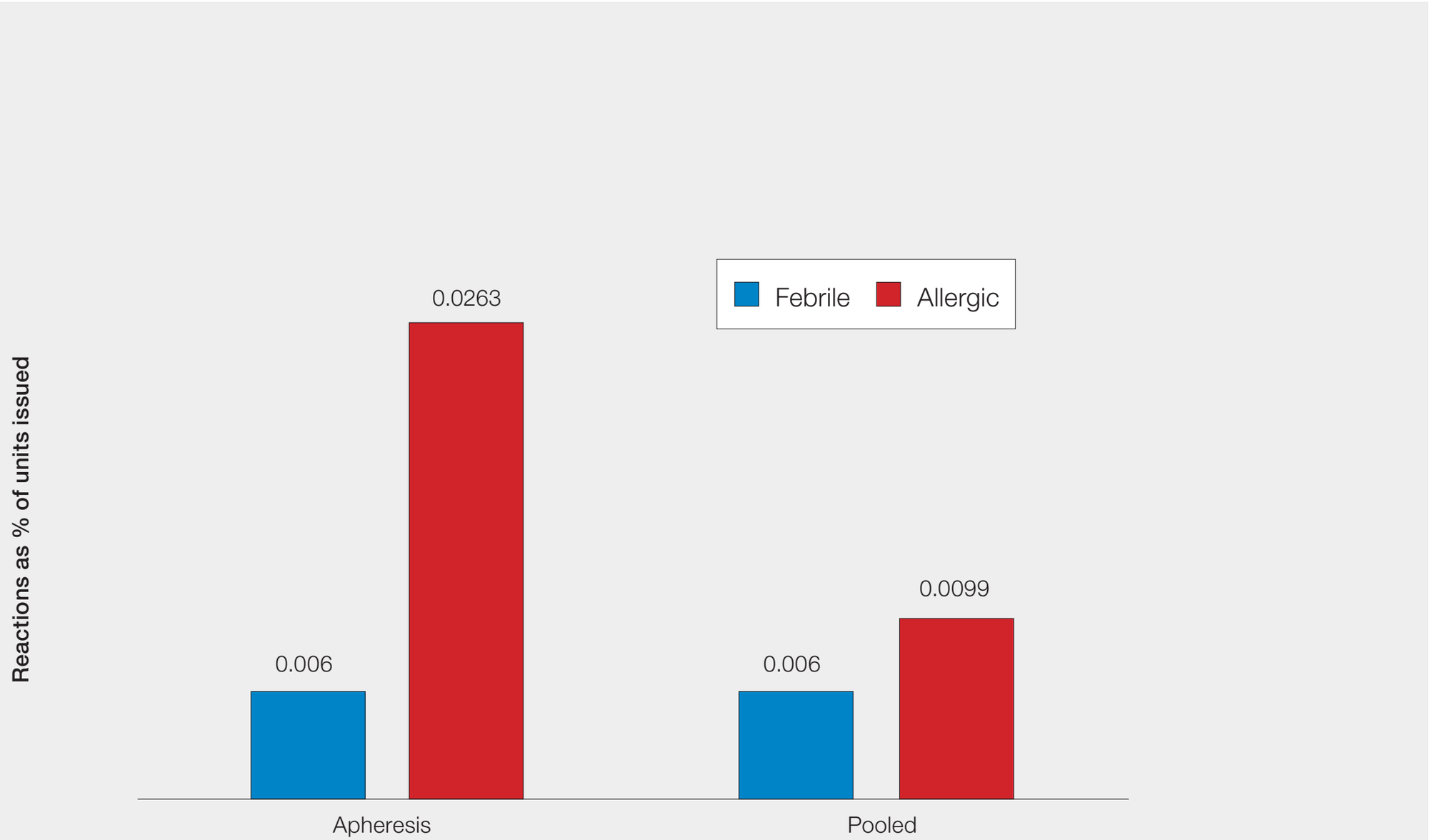
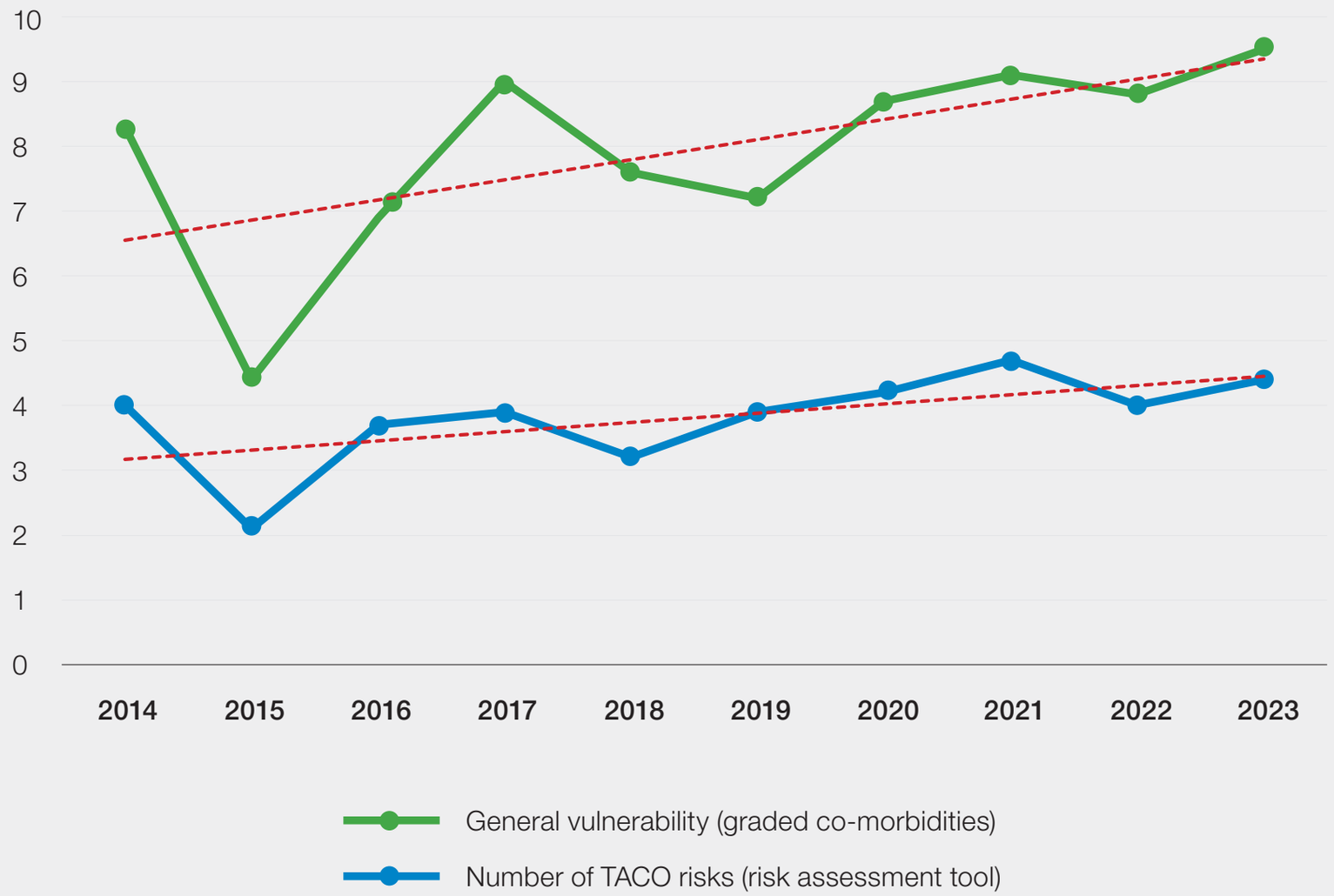


Figure 18.1: The number of TACO risk factors and graded TACO vulnerability among TACO-related deaths reported to SHOT 2014-2023



TACO=transfusion-associated circulatory overload

Figure 18.2: Cumulative incidence of usage of the SHOT TACO risk-assessment tool in TACO-related deaths 2019-2023

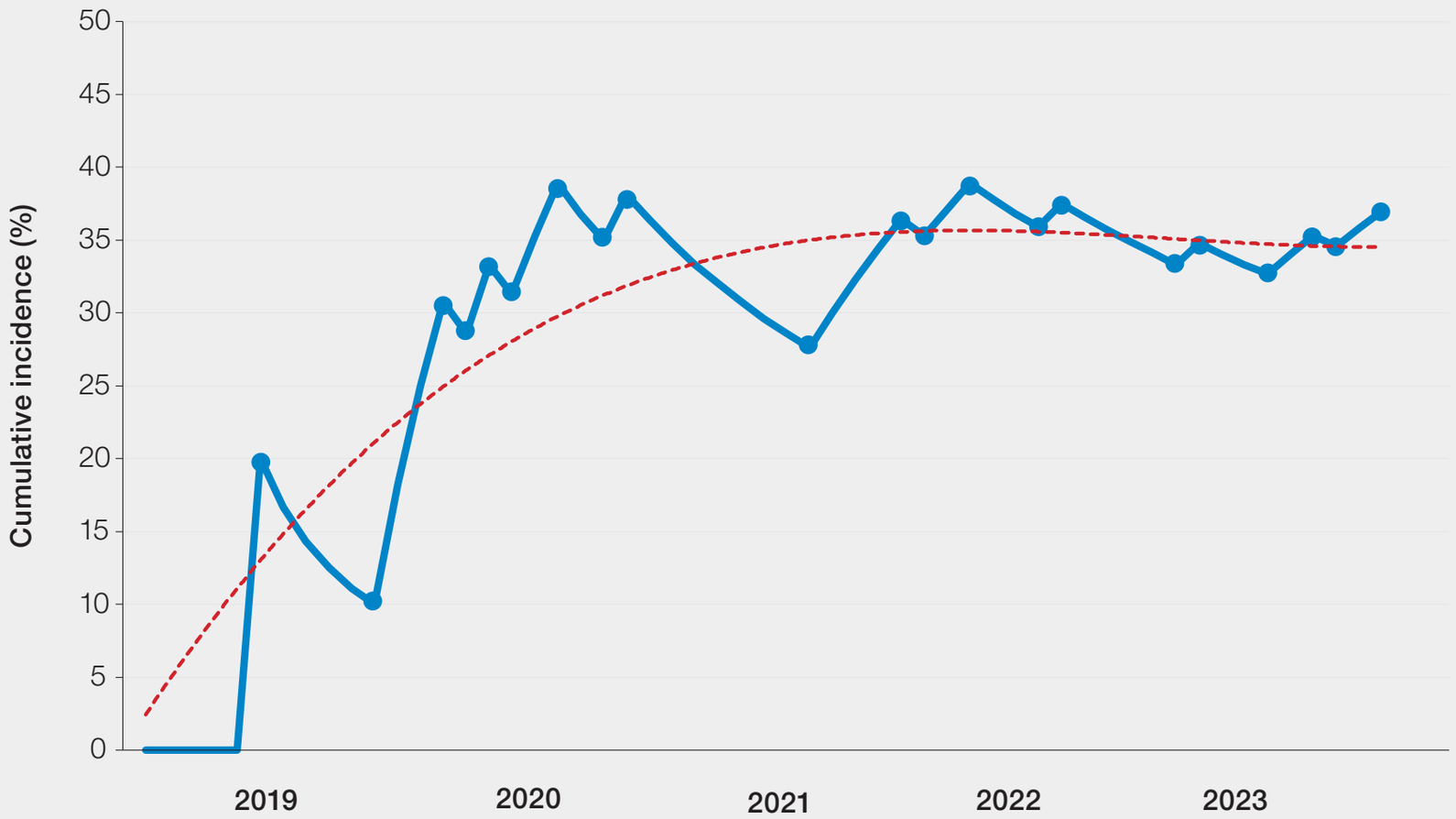


Figure 18.3: Rolling cumulative incidence of use of the SHOT TACO incident investigation tool for the previous 5 cases of TACO-related deaths 2021-2023

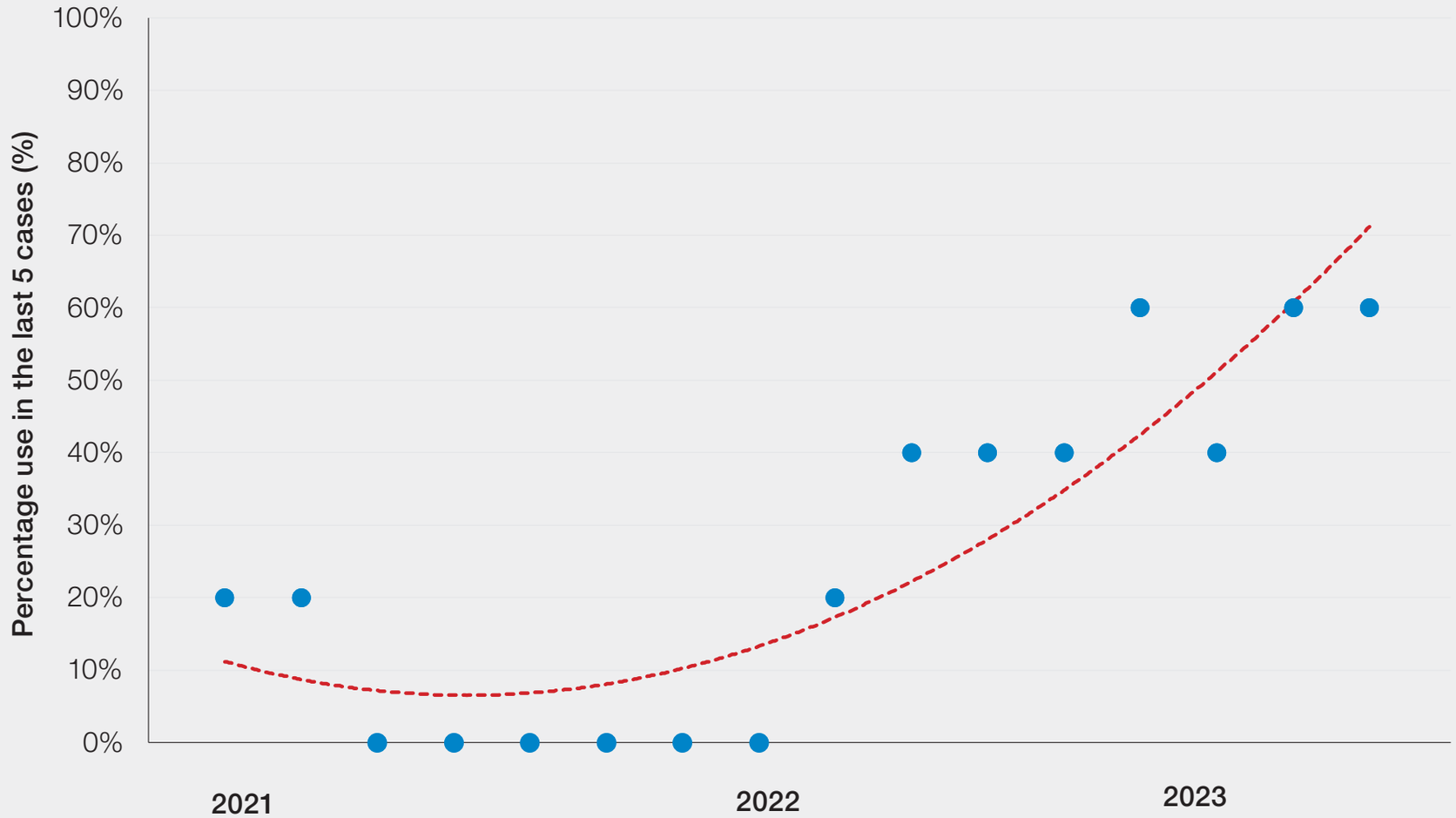


Figure 18a.1: TACO pre-transfusion risk assessment

TACO Risk Assessment		YES	NO
	Does the patient have any of the following: 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?		
	Is the patient known to have pulmonary oedema?		
	Does the patient have respiratory symptoms of undiagnosed cause?		
	Is the fluid balance clinically significantly positive?		
	Is the patient receiving intravenous fluids (or received them in the previous 24 hours)?		
	Is there any peripheral oedema?		
	Does the patient have hypoalbuminaemia?		
	Does the patient have significant renal impairment?		

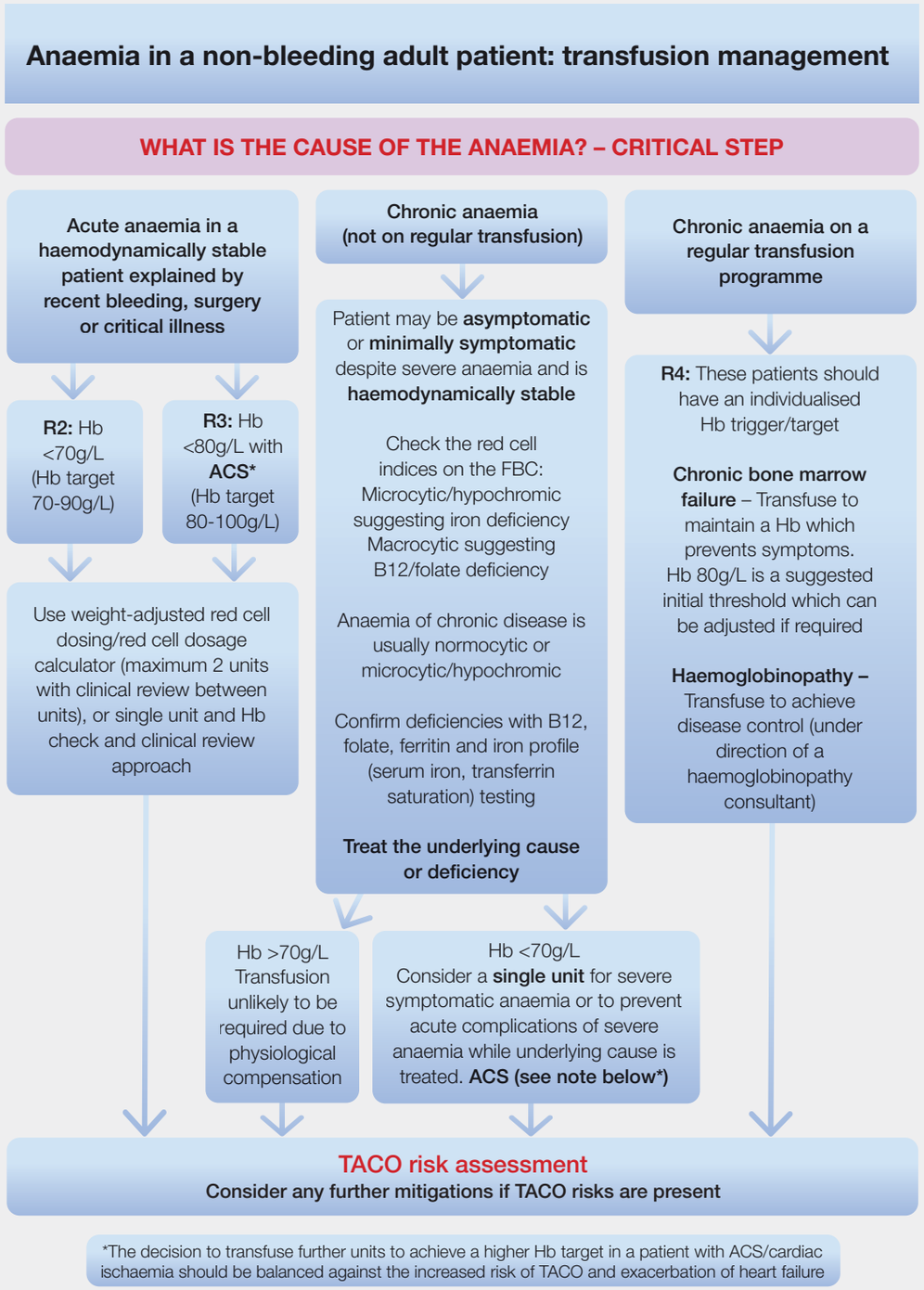
If Risks Identified	YES	NO
Review the need for transfusion (do the benefits outweigh the risks)?		
Can the transfusion be safely deferred until the issue is investigated, treated or resolved?		

If Proceeding with Transfusion: Assign Actions	TICK
Body weight dosing for red cells	
Transfuse a single unit (red cells) and review symptoms	
Measure fluid balance	
Prophylactic diuretic prescribed (where appropriate/not contraindicated)	
Monitor vital signs closely, including oxygen saturation	

Name (PRINT):	**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.**
Role:	
Date: **Time (24hr):**	
Signature:	

TACO=transfusion-associated circulatory overload

Figure 18a.2: Transfusion management approach in non-bleeding adult patients



ACS=acute coronary syndrome; FBC=full blood count; Hb=haemoglobin; TACO=transfusion-associated circulatory overload

Figure 18b.1: Pre-transfusion features of pulmonary cases
Figure 18b.1a: Risk factors

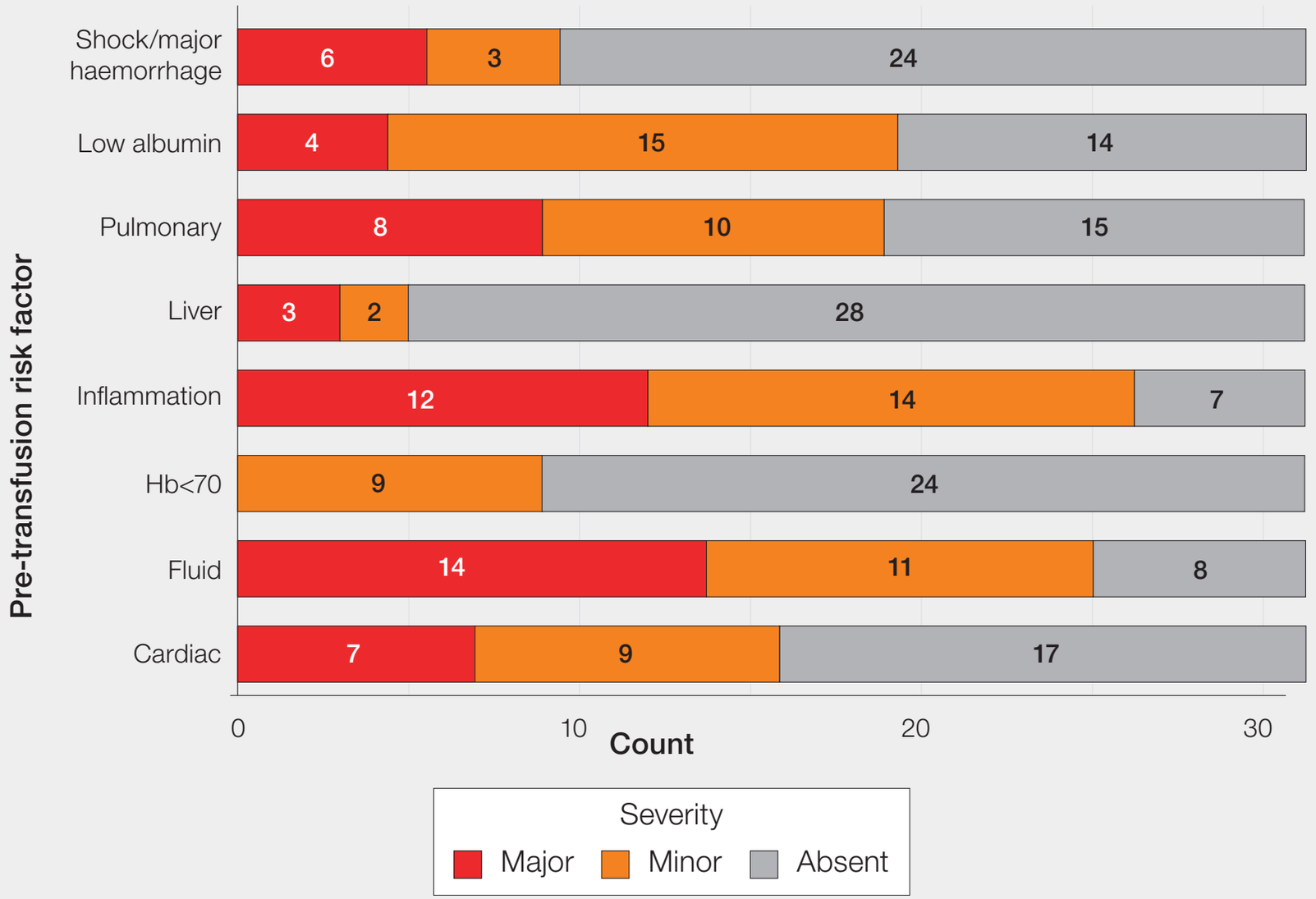


Figure 18b.1b: State factors

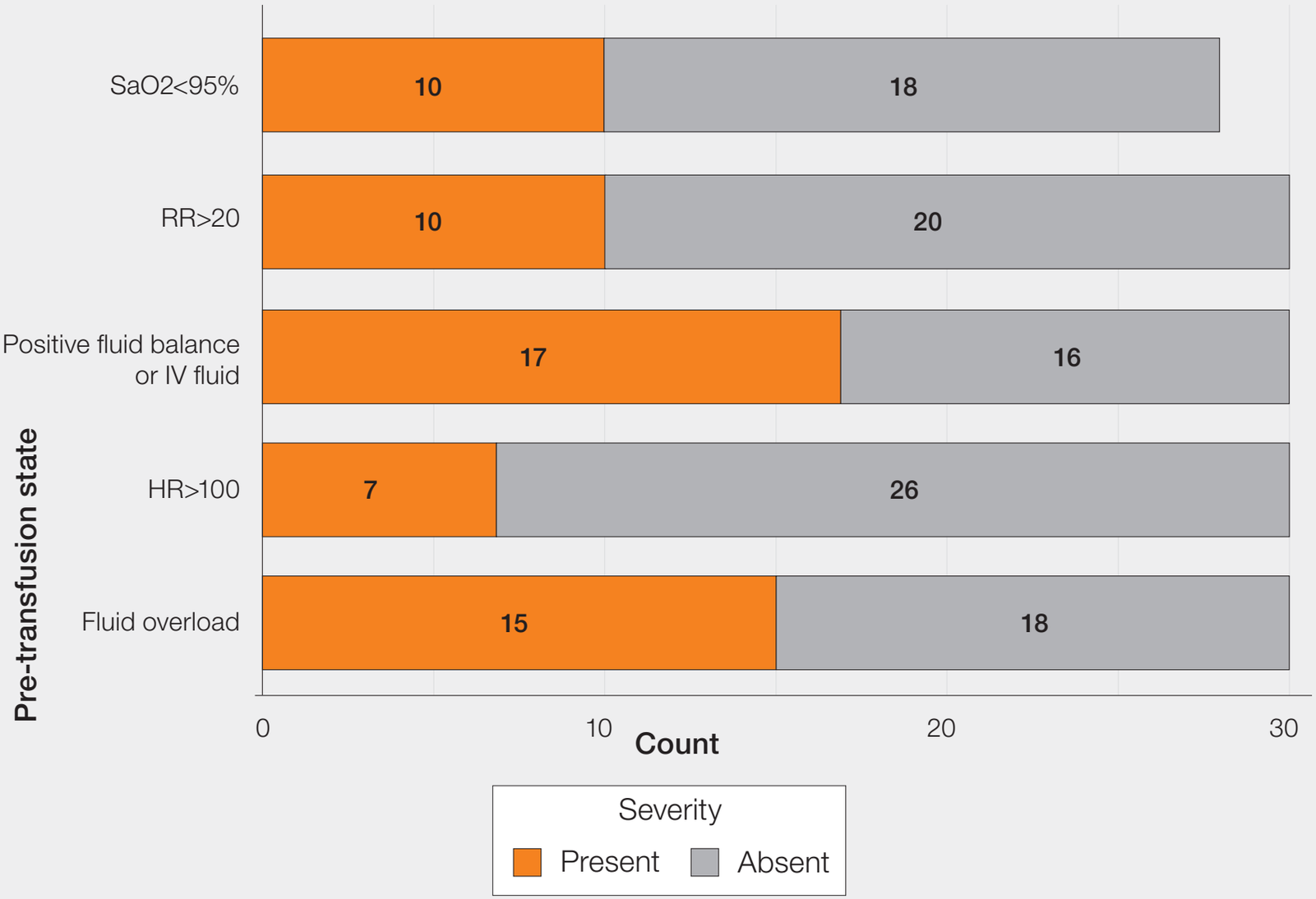
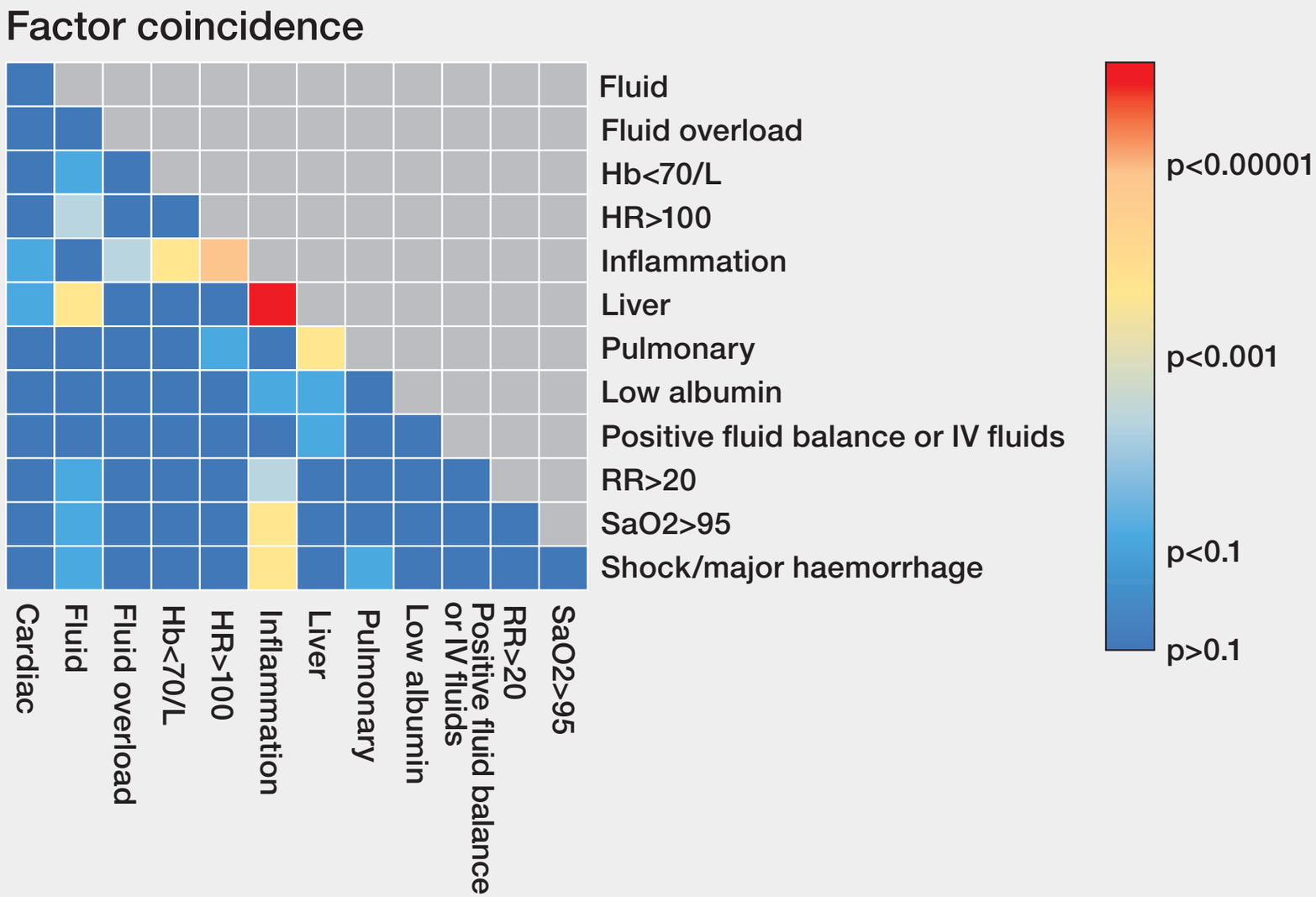


Figure 18b.2: Statistical significance of factor coincidence (Fisher exact test with multiple testing correction)



Hb=haemoglobin; HR=heart rate; RR=respiratory rate; SaO2=oxygen saturation

Figure 19.1: Age range in males and females experiencing a HTR in 2023

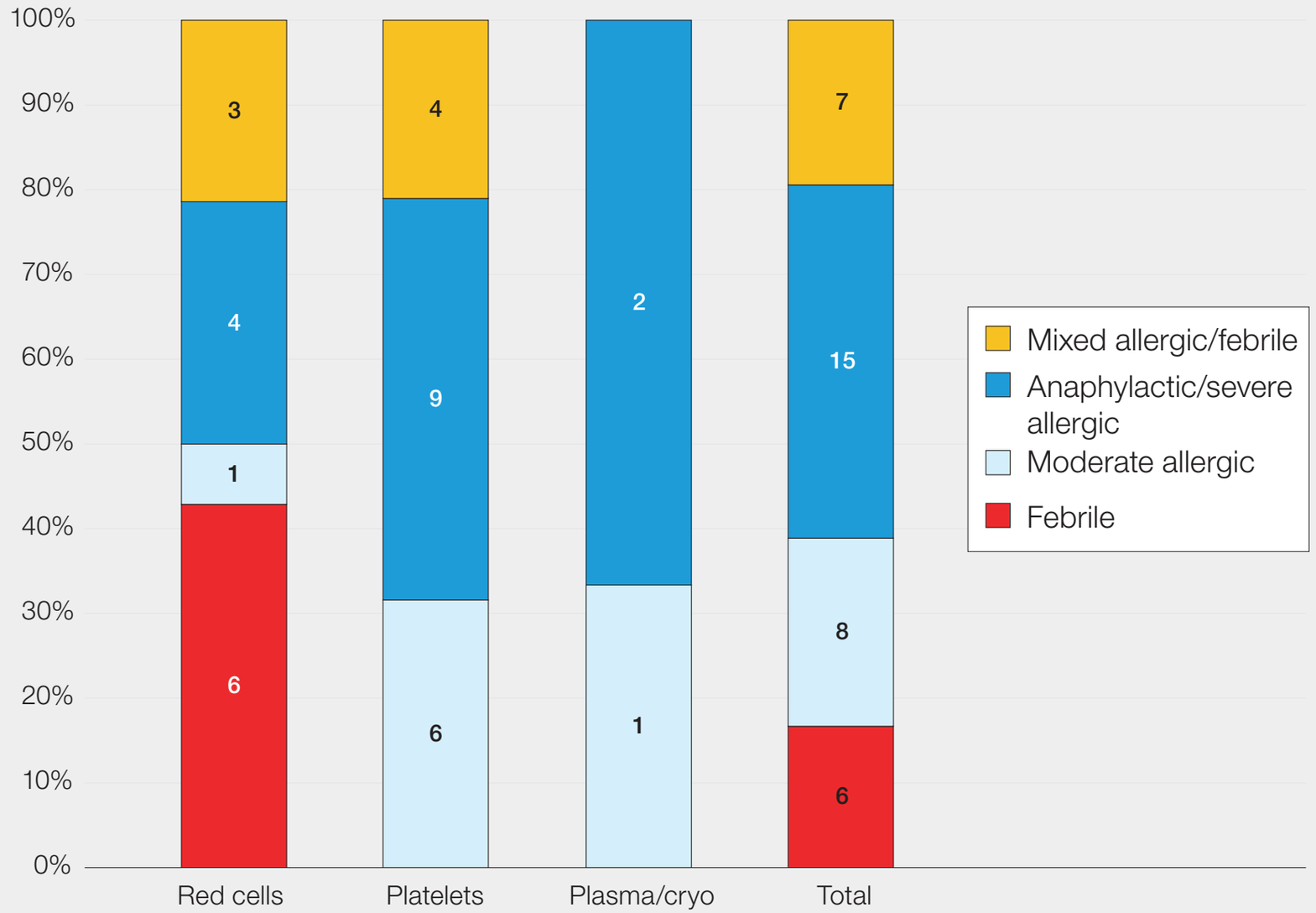
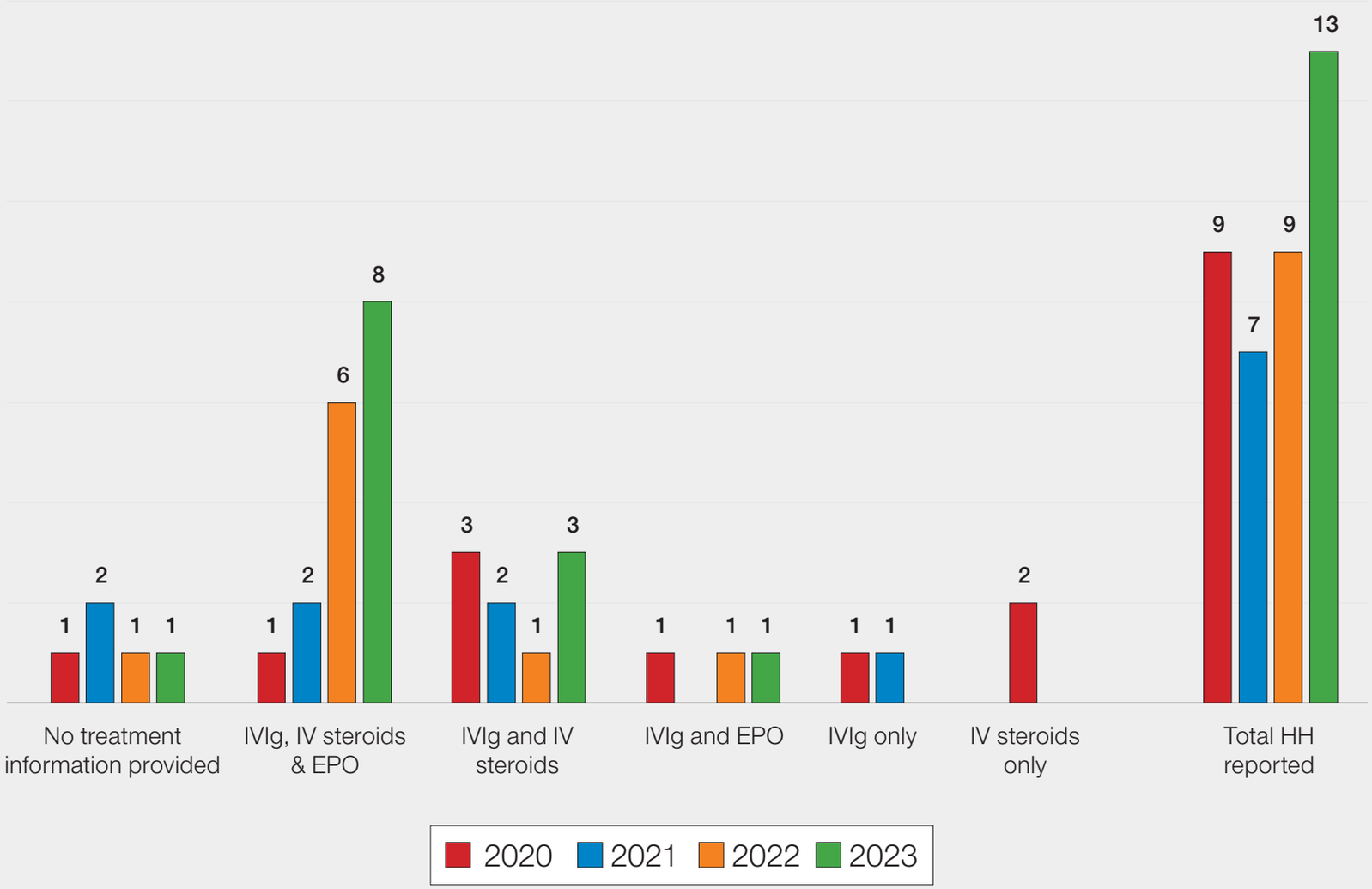


Figure 19.1 is a box and whisker diagram showing the median age and the age range of patients experiencing a HTR reported to SHOT separated by gender. The middle bar in the shaded box indicates the median age, the outer bars of the box represent the upper and lower quartiles. The lines extending from the boxes (whiskers) indicate the lowest and highest values.

Figure 19.2: Treatments used to manage hyperhaemolysis



EPO=erythropoietin; HH=hyperhaemolysis; IV=intravenous; IVIg=intravenous immunoglobulin

Figure 19.3: Alloantibodies reported in AHTR in 2023

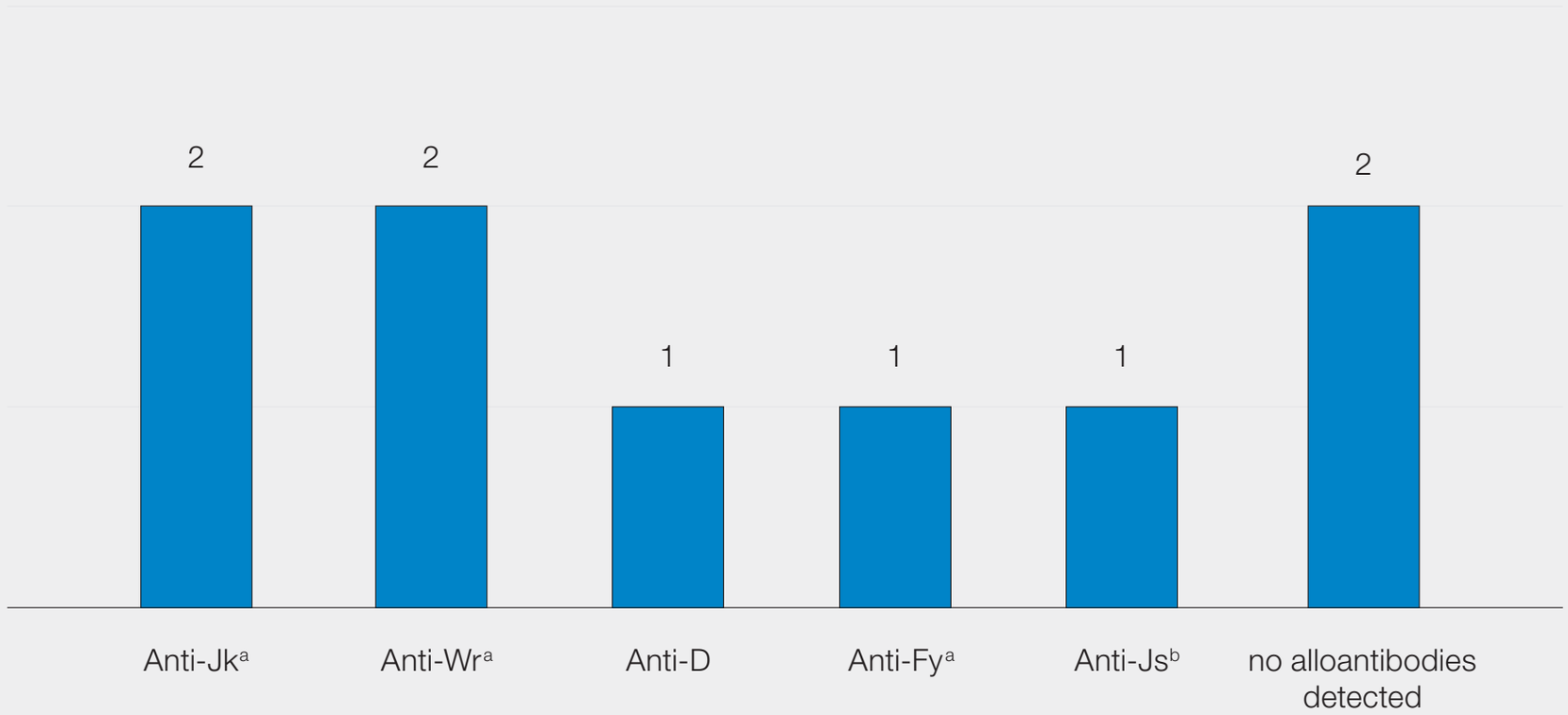


Figure 19.4: Alloantibodies implicated in DHTR in 2023

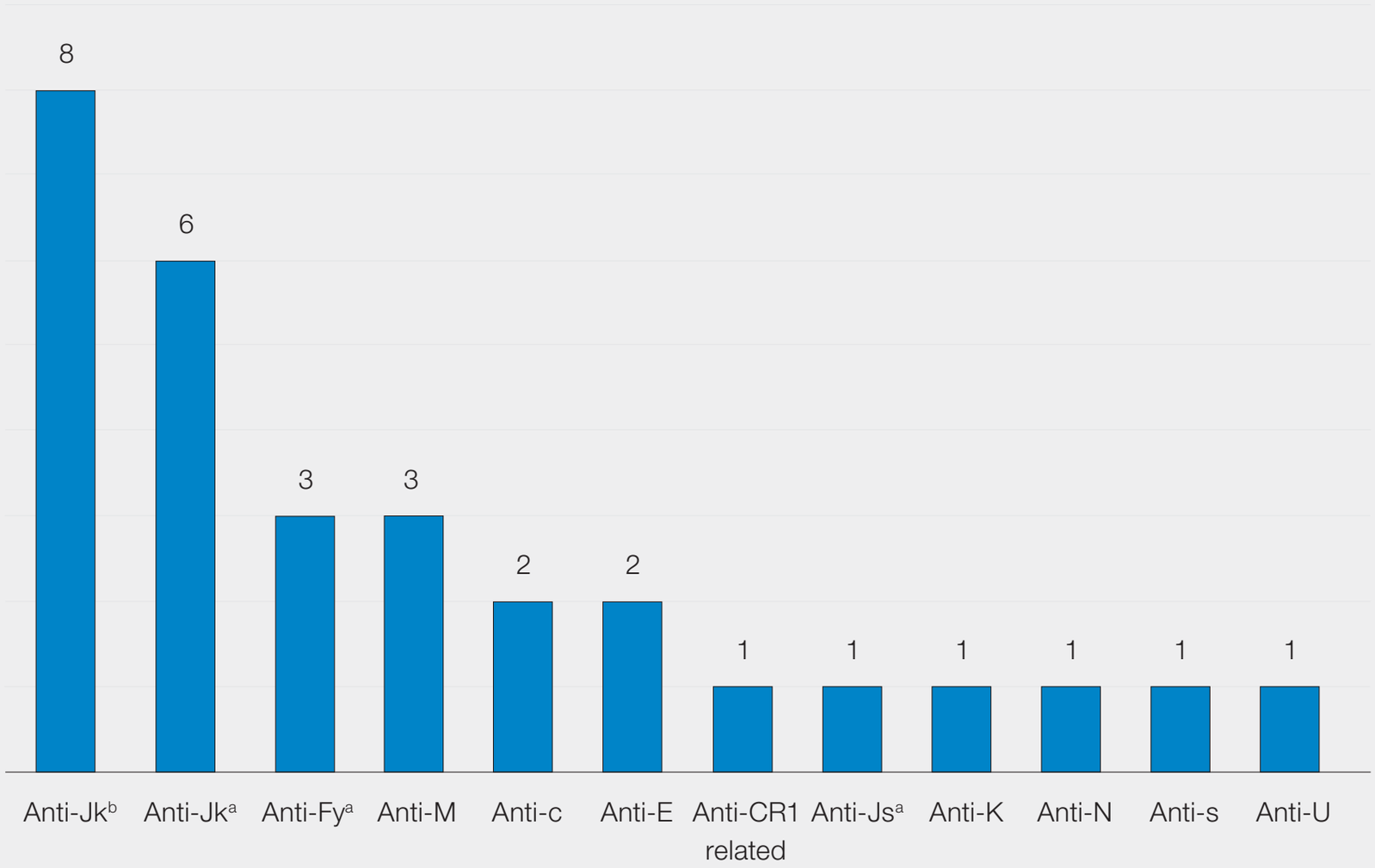
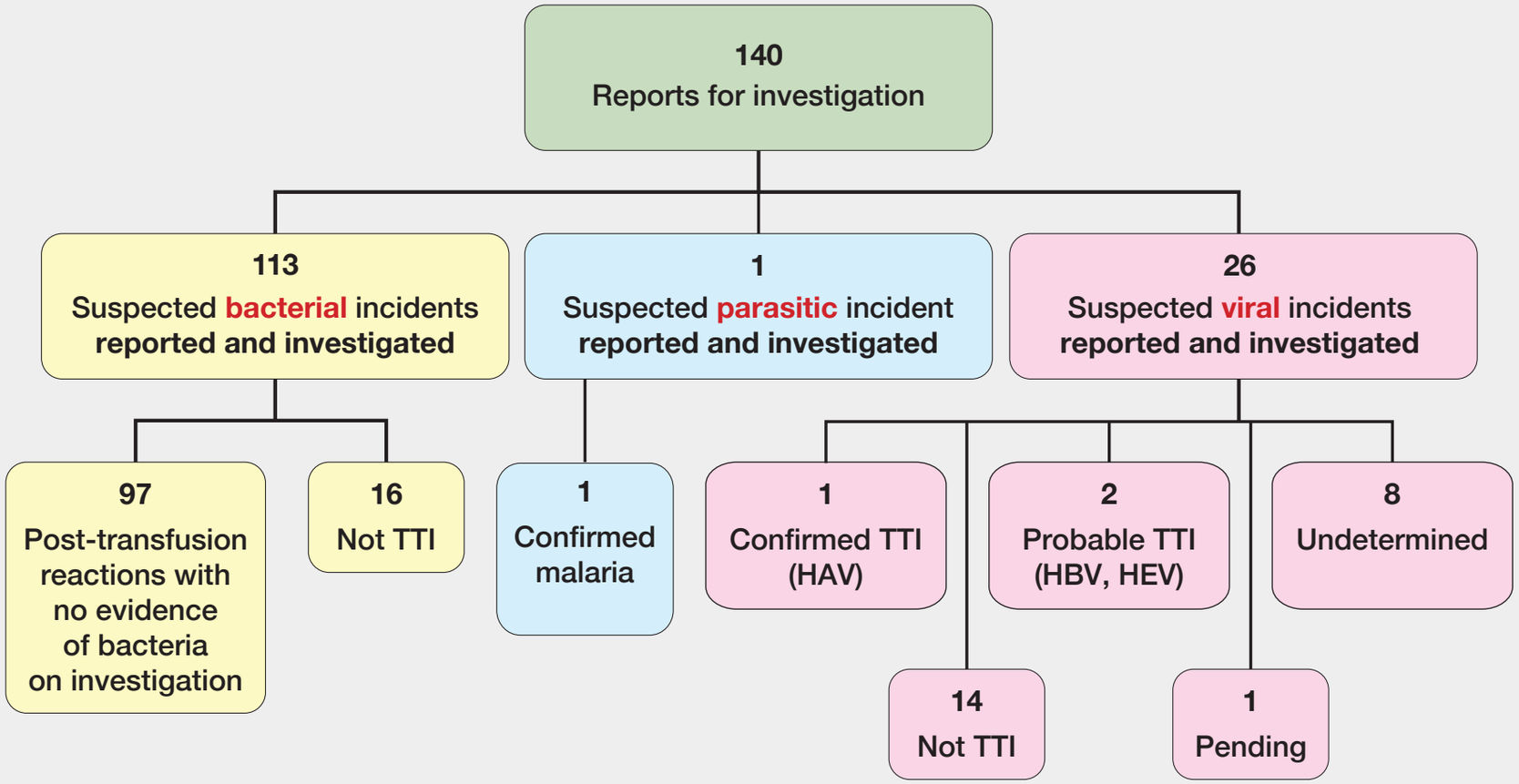


Figure 21.1: Outcomes of suspected TTI reported to NHSBT/UKHSA Epidemiology Unit and investigated in 2023 in England, Northern Ireland, Scotland, and Wales



TTI=transfusion-transmitted infection; HBV=hepatitis B virus

Figure 24.1: Trends in paediatric reports 2014-2023

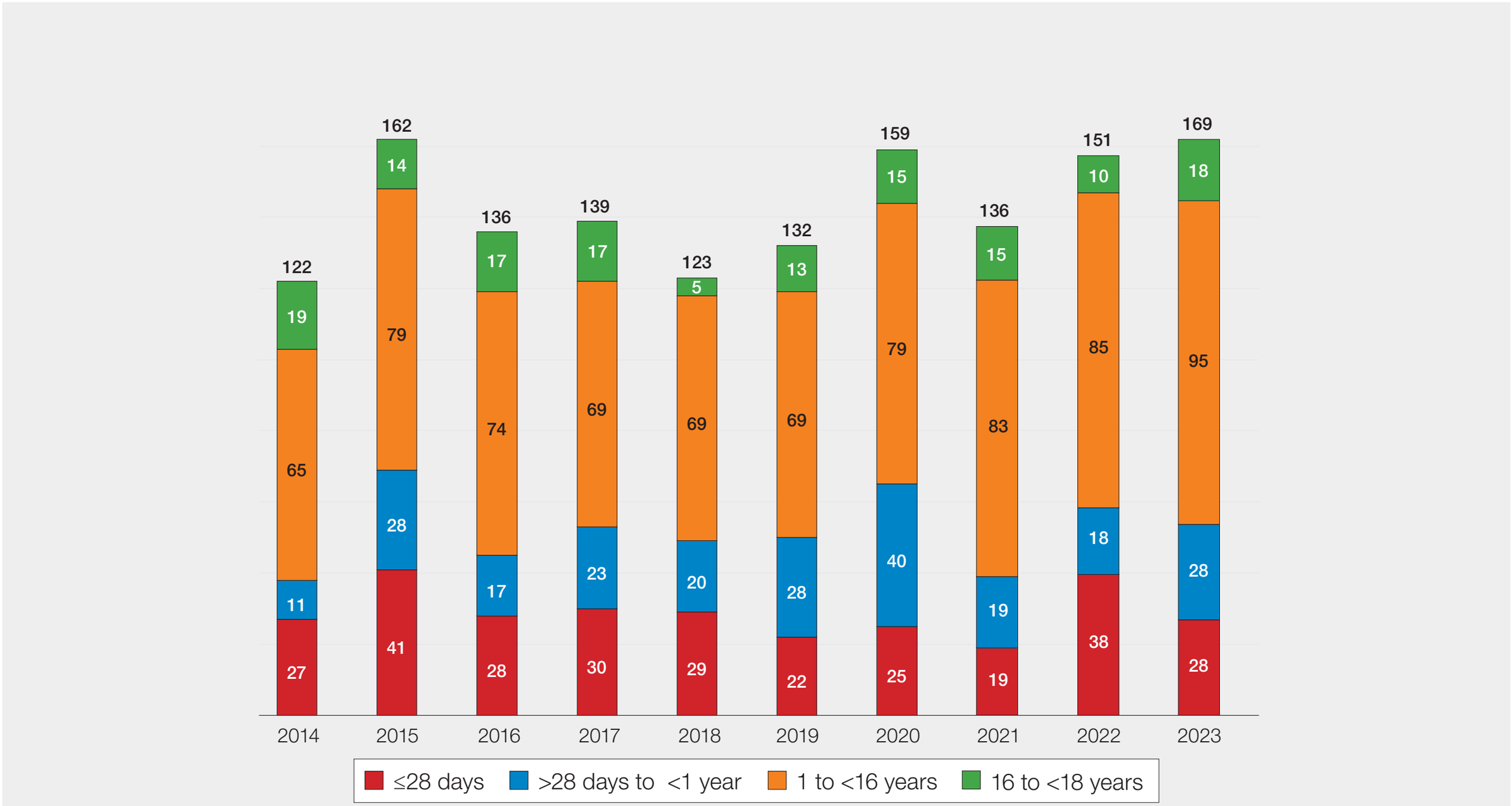
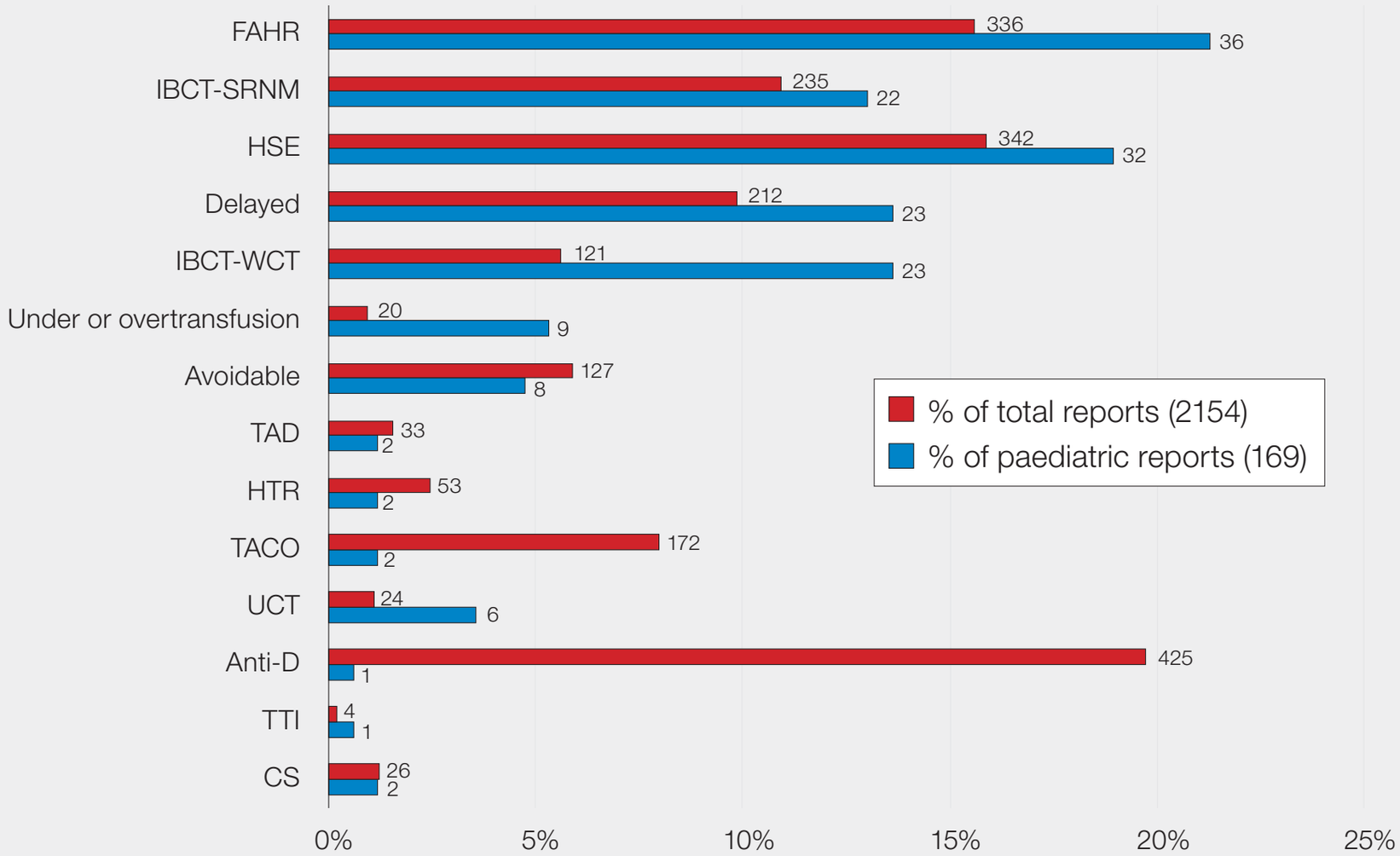


Figure 24.2: Percentages of paediatric and total reports in each category in 2023 (n=169)



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

Figure 24.3: Summary of paediatric cases by category and age in 2023 (n=169)

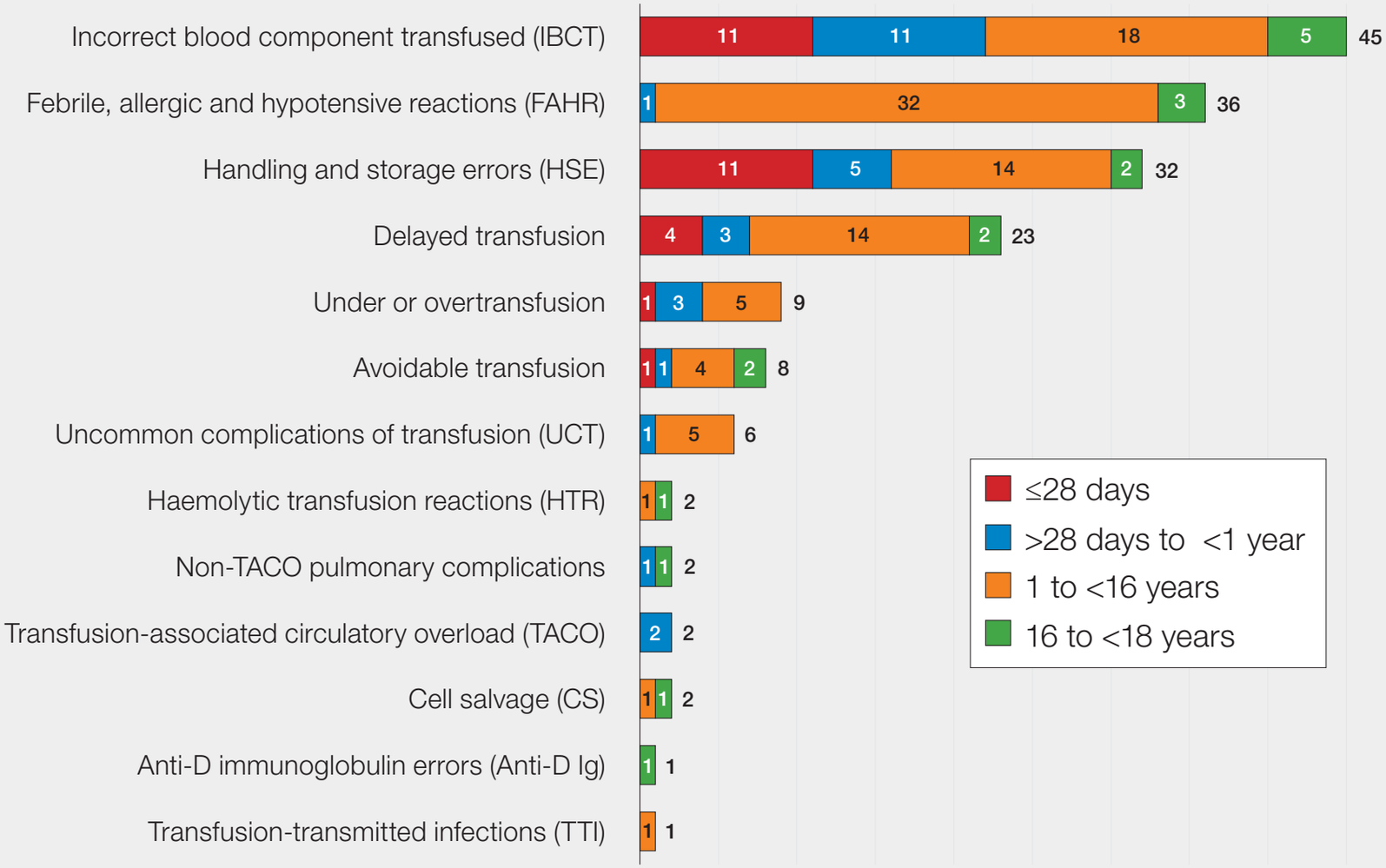
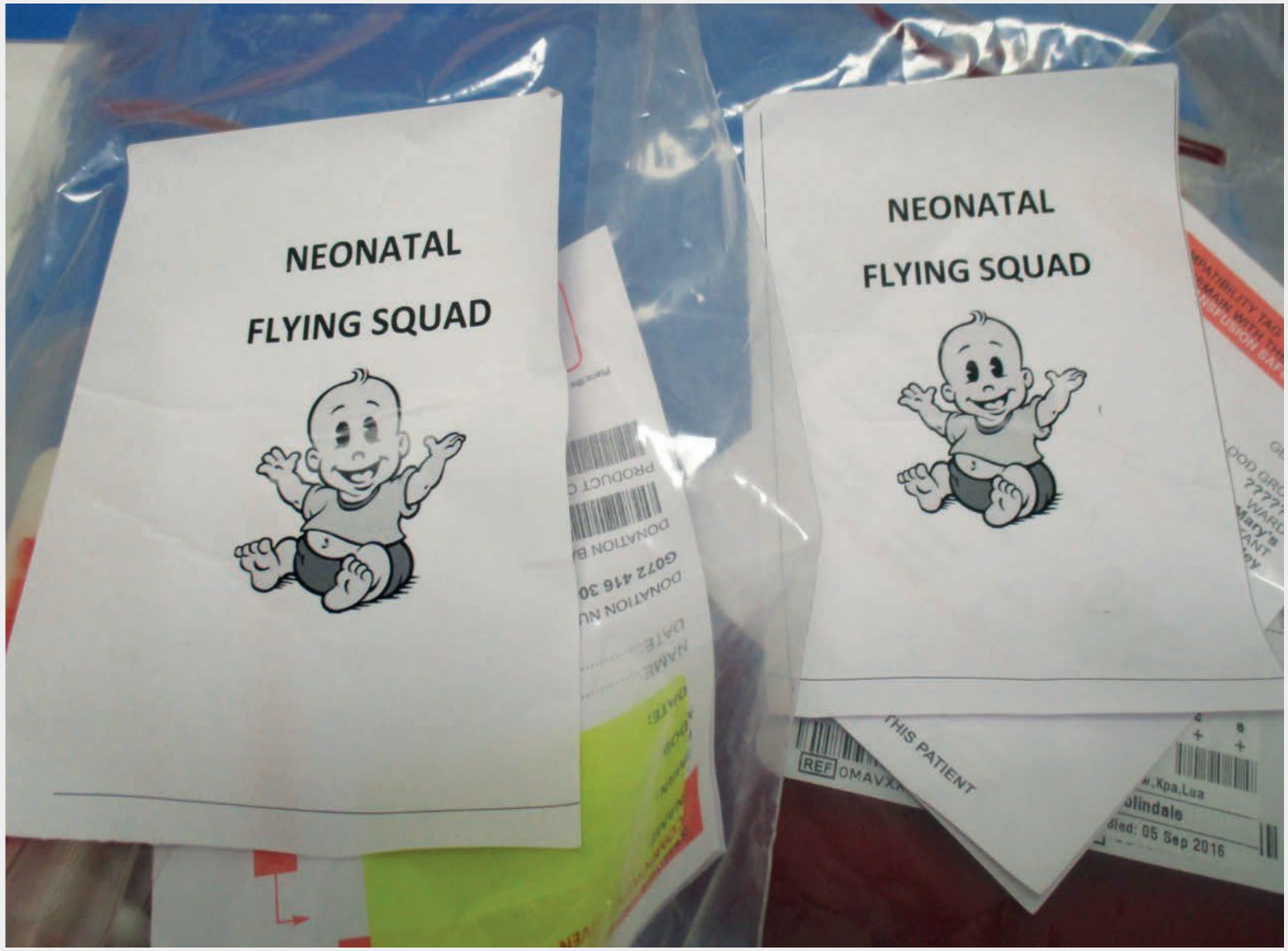


Figure 24.4: Example of how to distinguish neonatal from adult components in a satellite refrigerator



With permission from Rachel Moss, transfusion practitioner at Great Ormond Street Hospital

Figure 24.5: Summary of paediatric FAHR reports by component type from 2014-2023

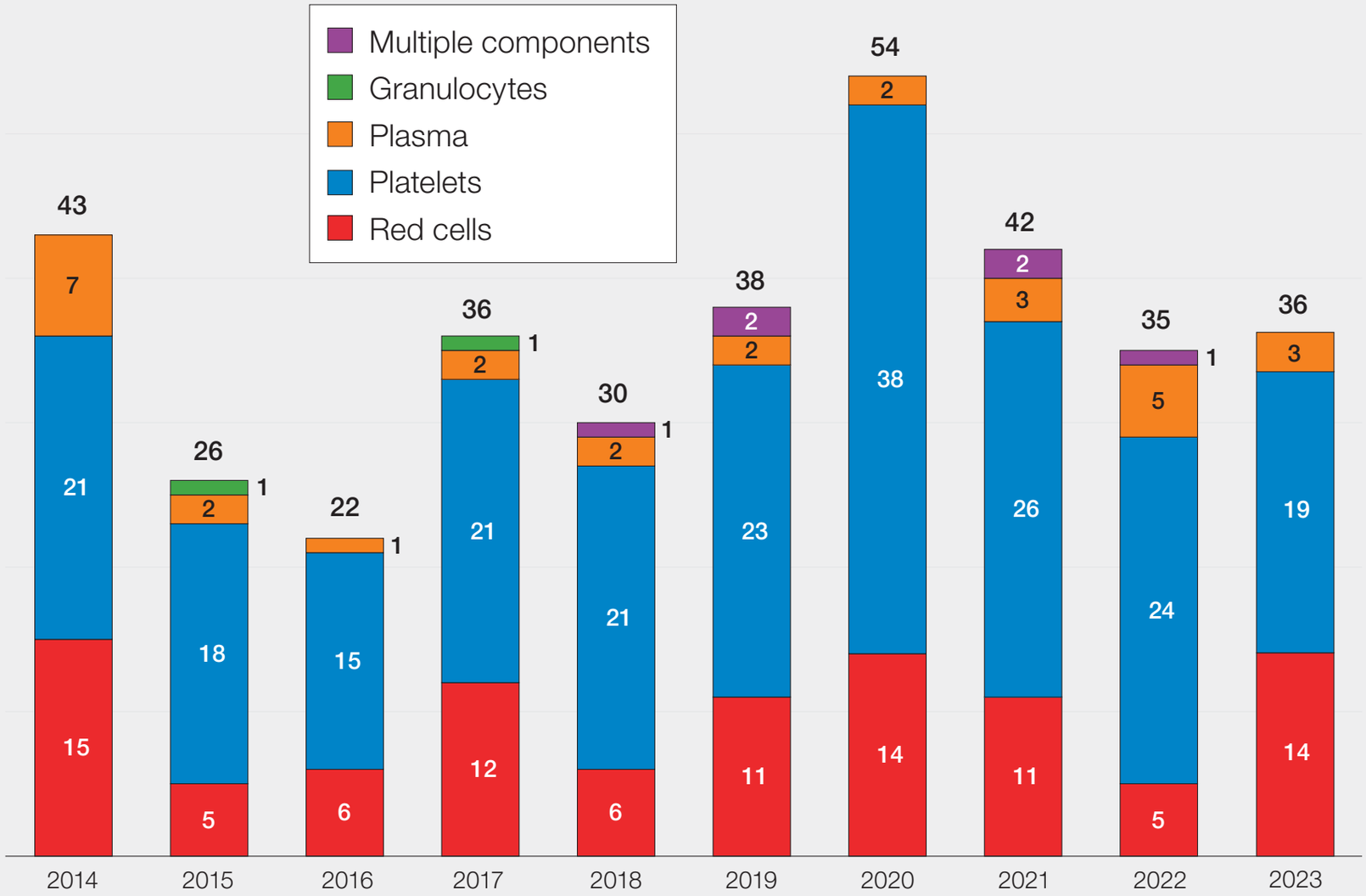


Figure 24.6: Paediatric febrile, allergic, and hypotensive reports (FAHR) in 2023 (n=36)

a: Comparison of proportions of adult and paediatric

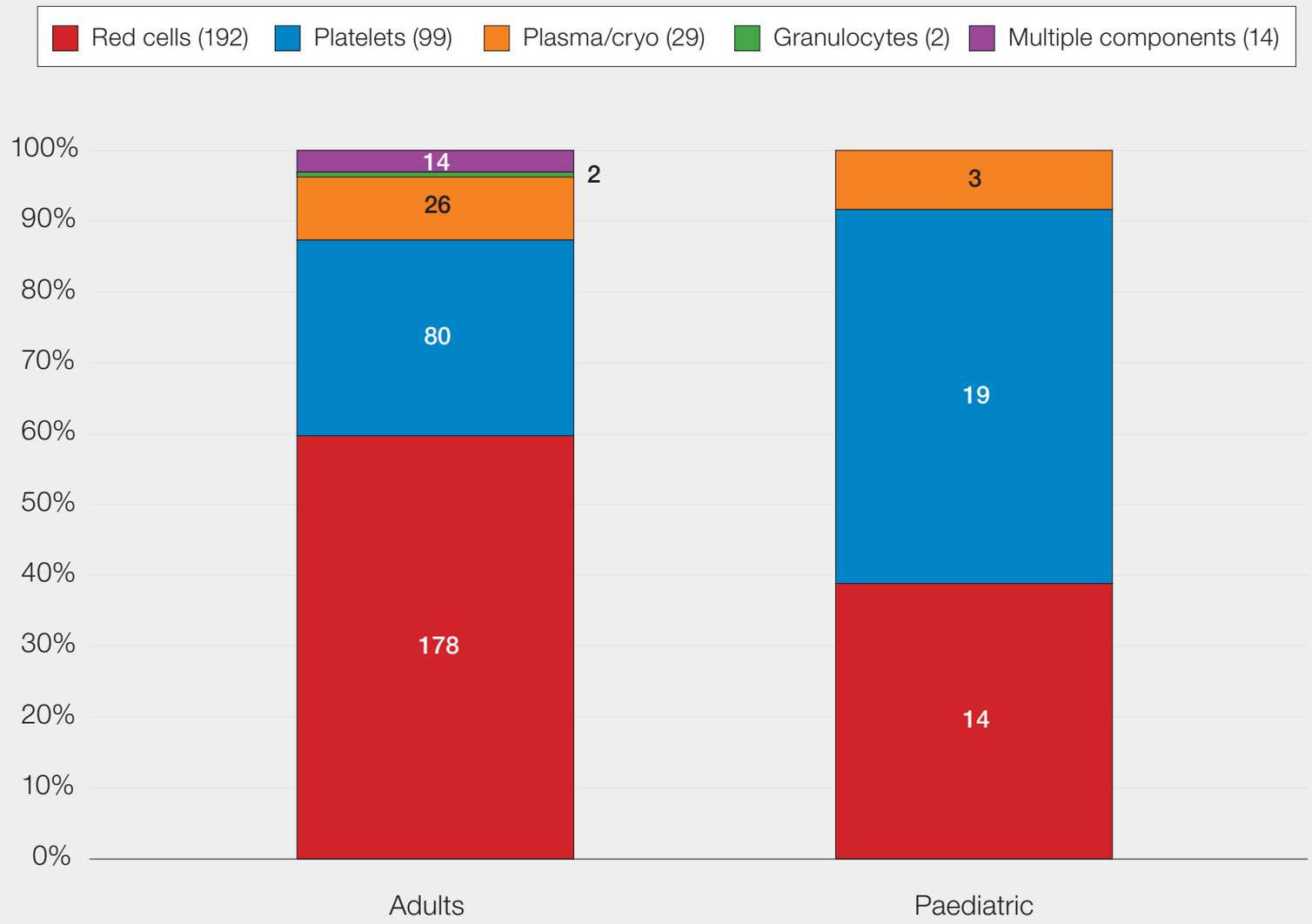


Figure 24.6: Paediatric febrile, allergic, and hypotensive reports (FAHR) in 2023 (n=36)
b: Percentages of reaction types by paediatric FAHR related to different component types for paediatric reports

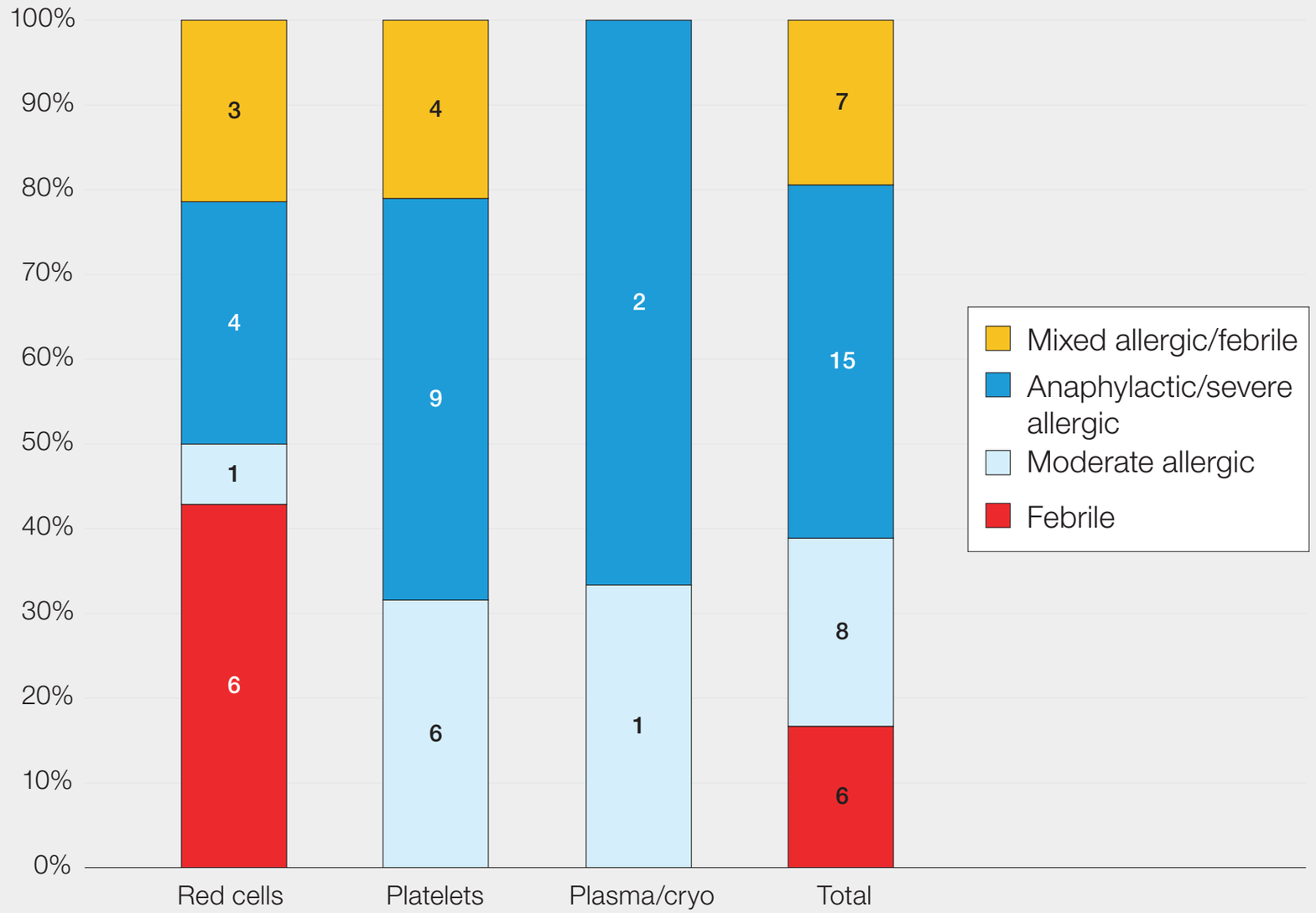
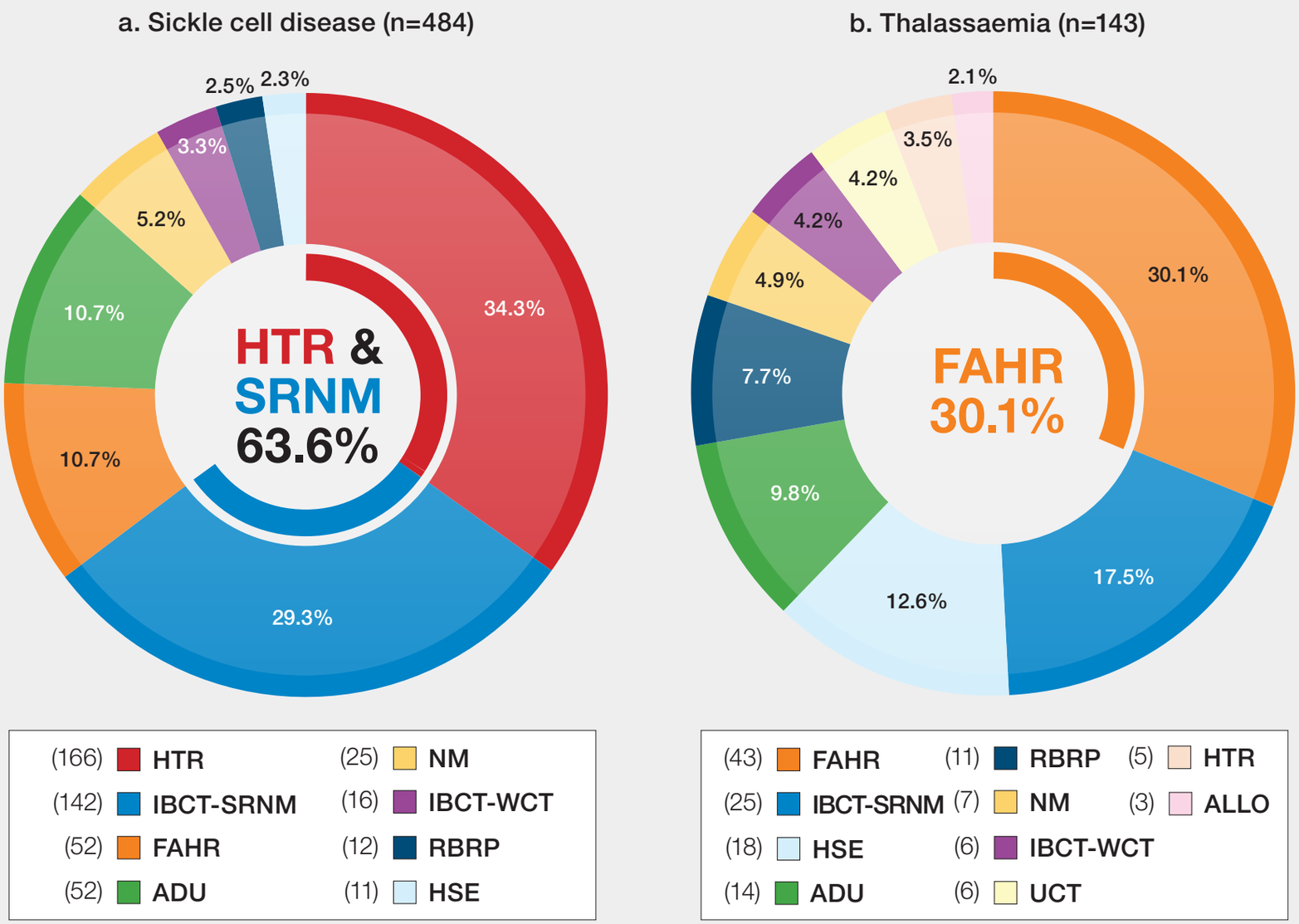
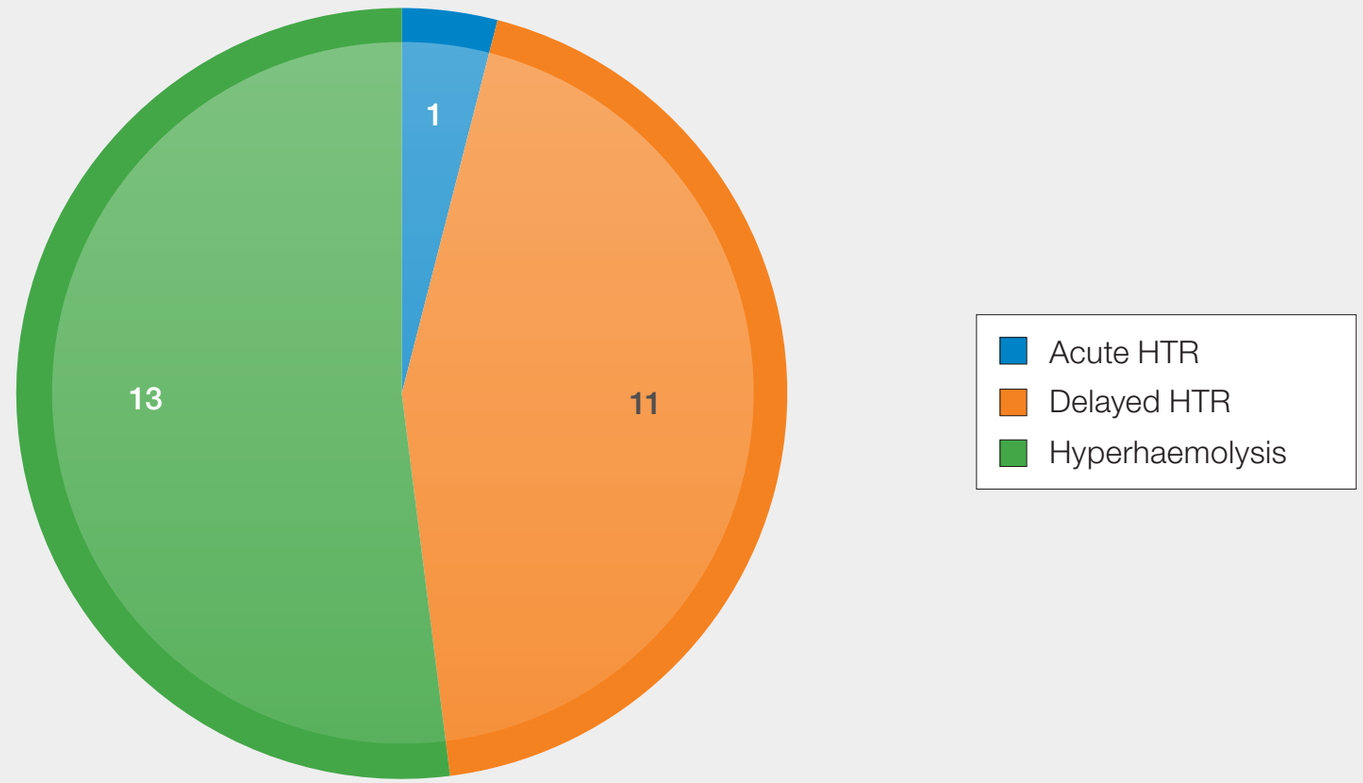


Figure 25.1: Cumulative data for adverse transfusion events in patients with haemoglobin disorders 2010 to 2023
a. Sickle cell disease (n=484) b. Thalassaemia (n=143)



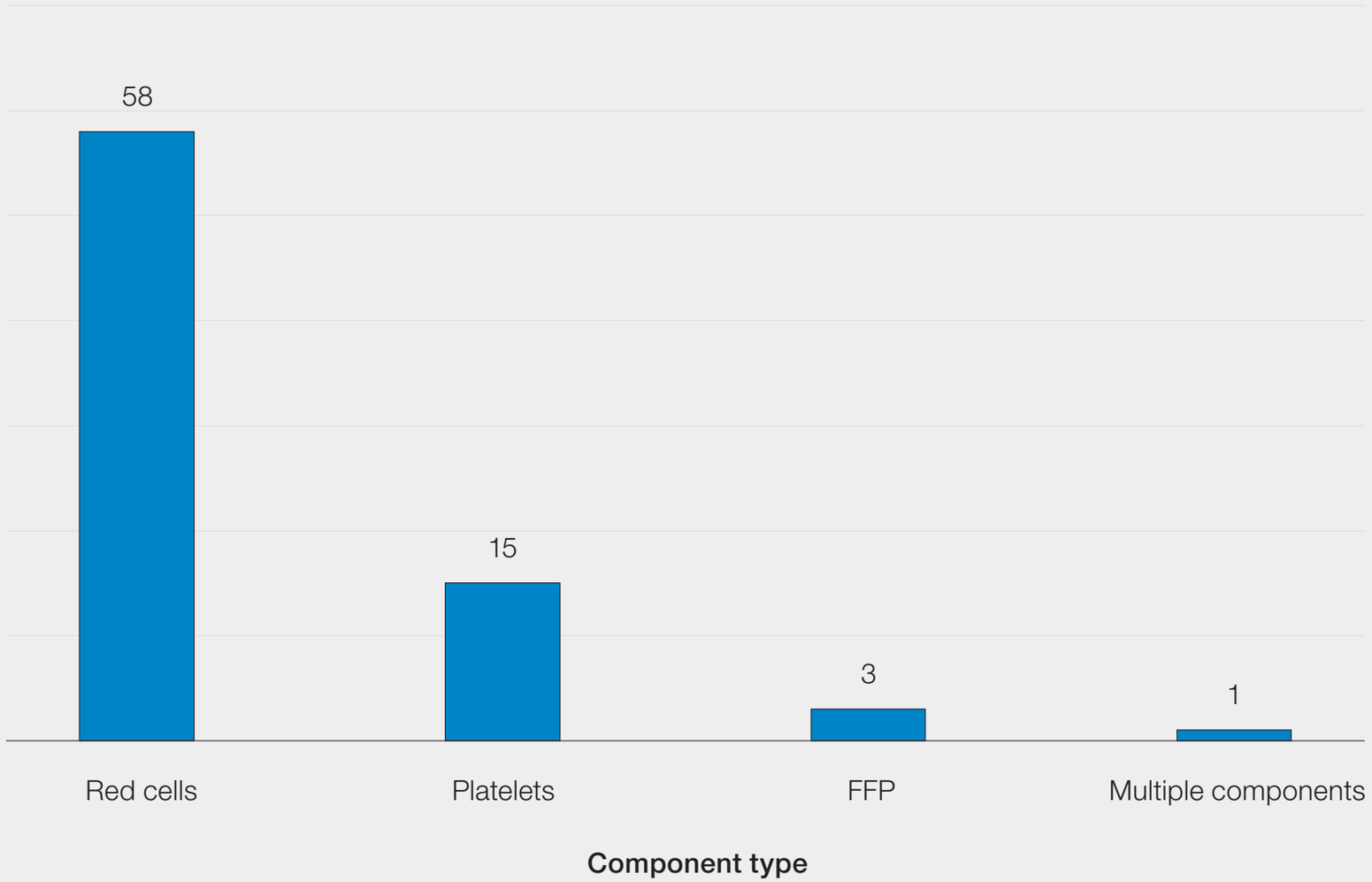
ADU=avoidable, delayed or under or overtransfusion; ALLO=alloimmunisation; FAHR=febrile, allergic or hypotensive reactions; HTR=haemolytic transfusion reactions; IBCT-SRNM=incorrect blood component transfused-specific requirements not met; IBCT-WCT=IBCT-wrong component transfused; NM=near miss; TACO=transfusion-associated circulatory overload; TAD=transfusion-associated dyspnoea; TTI=transfusion-transmitted infection; UCT=uncommon complications of transfusion Categories with 2 or fewer reports are not included in the figures

Figure 25.2: Types of HTR reported in patients with haemoglobin disorders in 2023 (n=25)



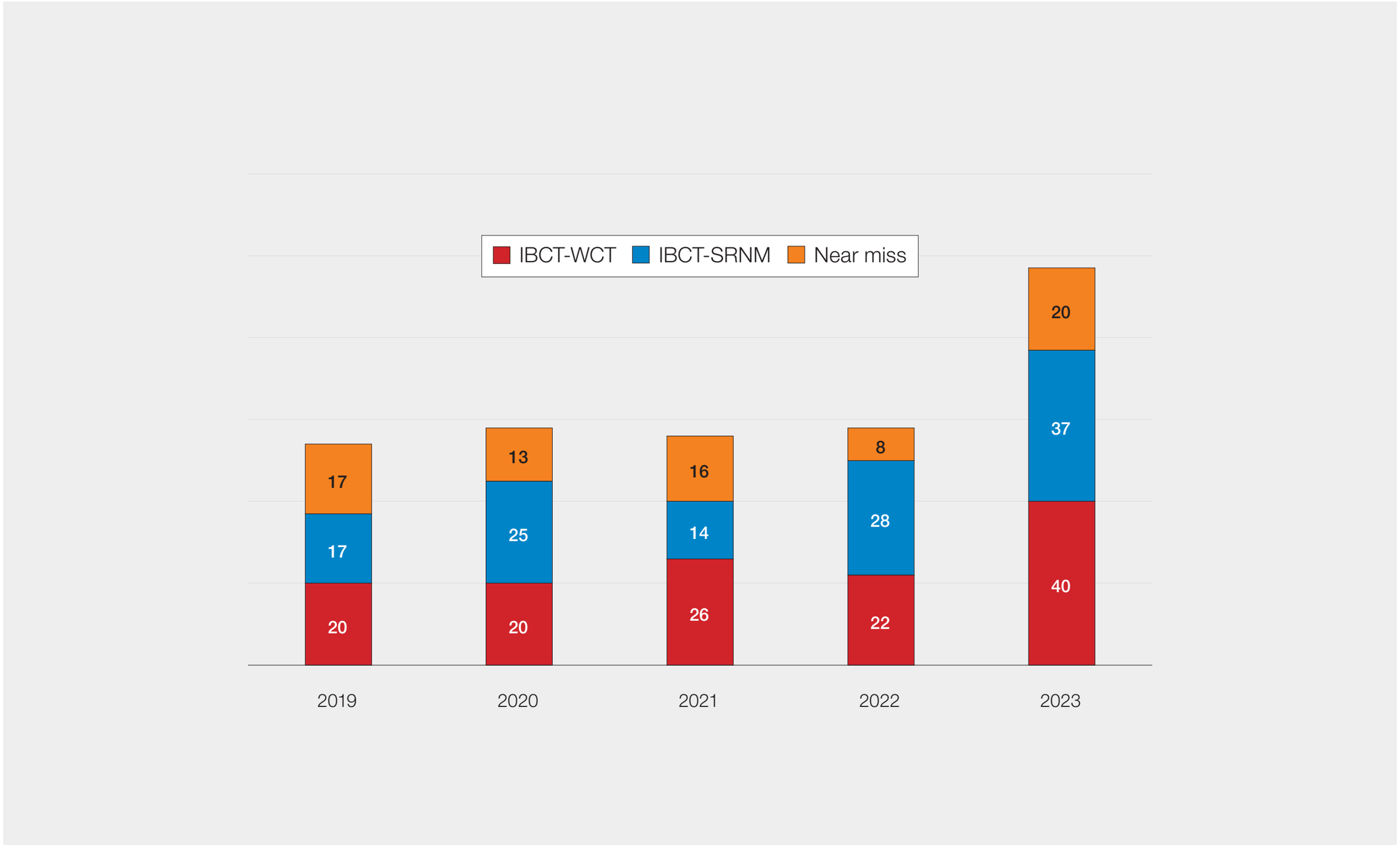
HTR=haemolytic transfusion reactions

Figure 26.1: Blood component implicated in the IBCT-WCT and IBCT-SRNM errors reported in 2023 (n=77)



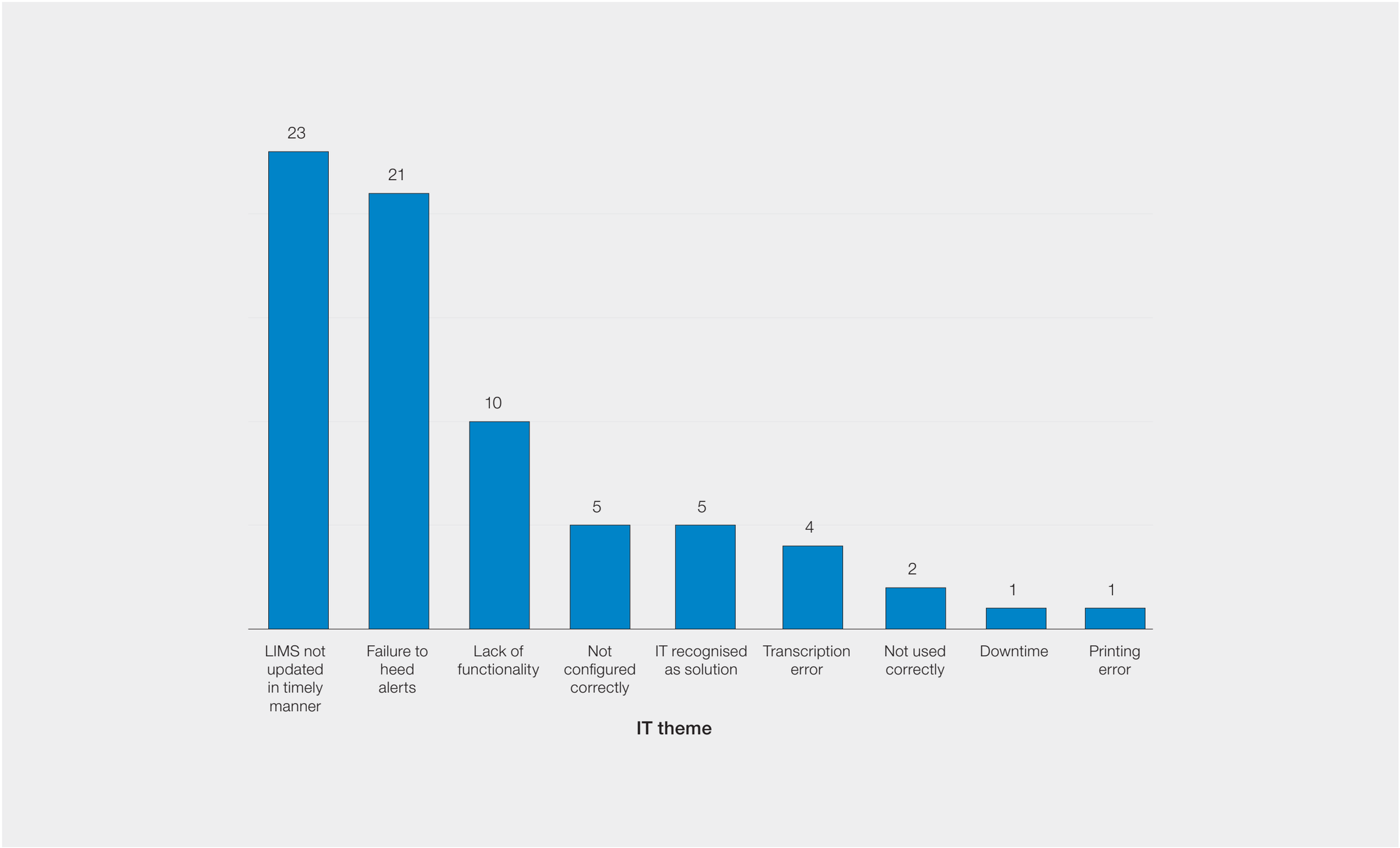
FFP=fresh frozen plasma

Figure 26.2: Number of transplant-related reports (HSCT and SOT) from 2019 to 2023



IBCT-SRNM=incorrect blood component transfused-specific requirements not met; IBCT-WCT=IBCT-wrong component transfused

Figure 26.3: Themes related to IT in transplant error cases reported in 2023 (n=72)



IT=information technology; LIMS=laboratory information management system

Figure 27.1: Number of reports of anti-D immunisation in pregnancy by year, 2012-2023

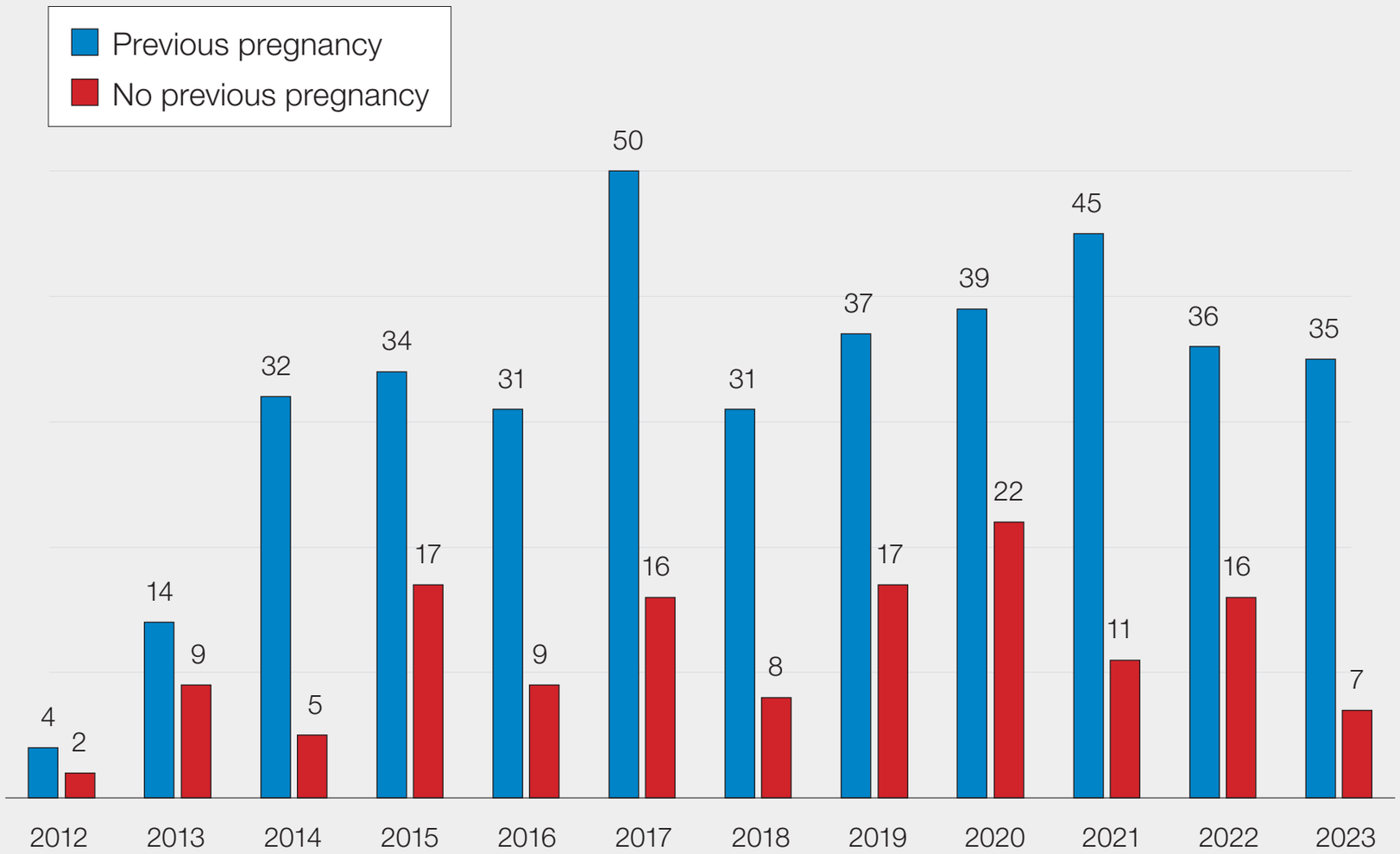
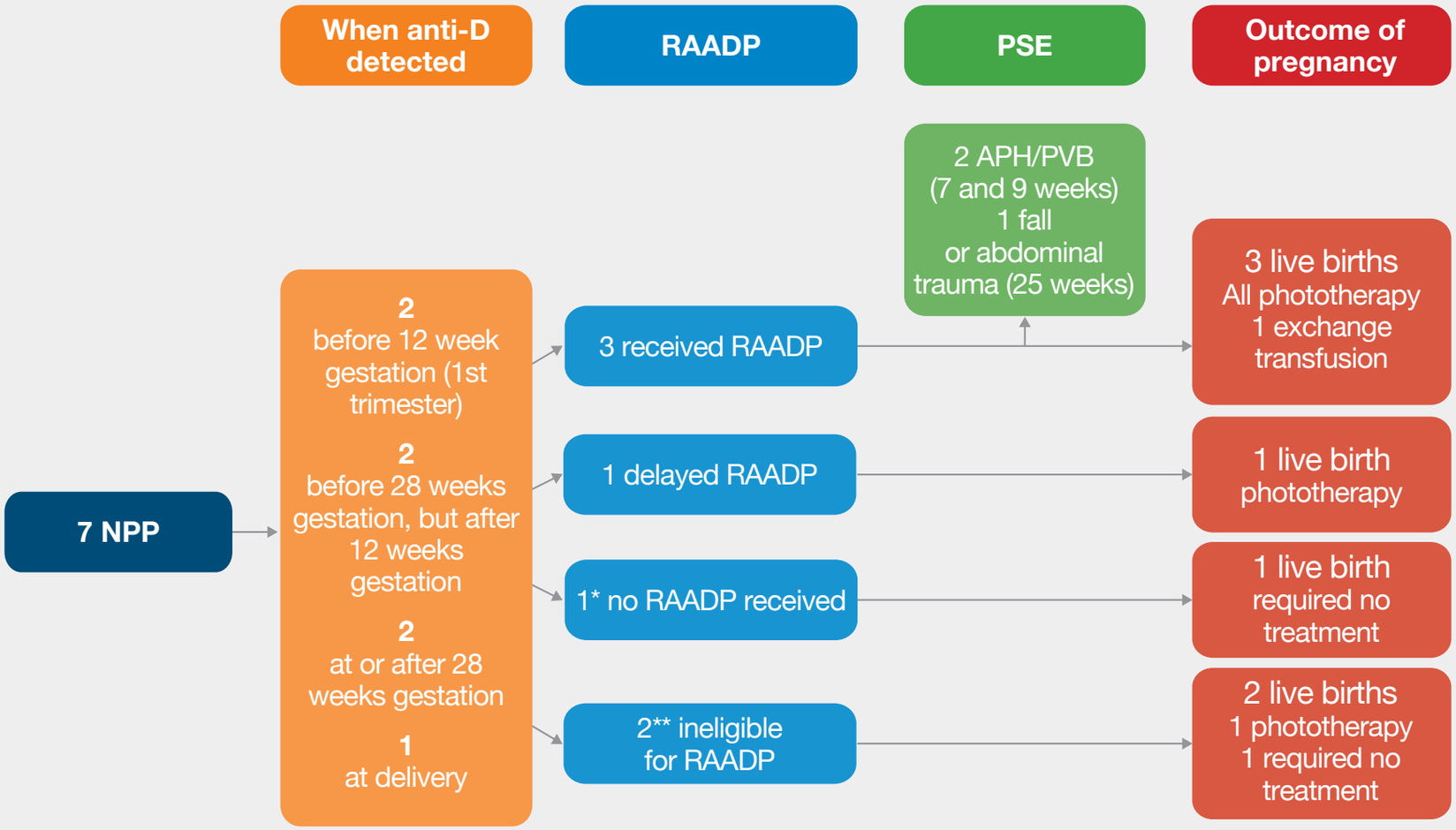
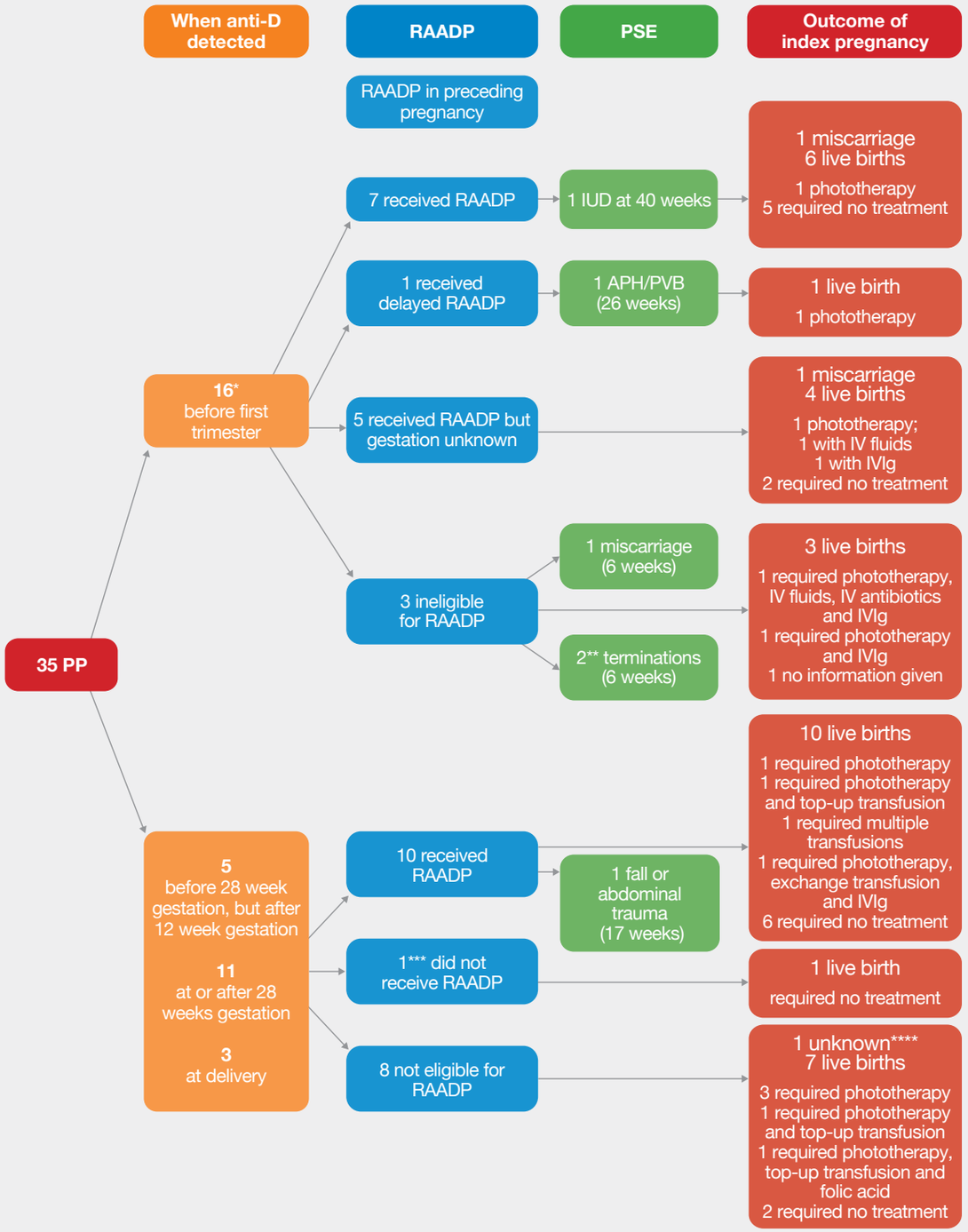


Figure 27.2: Summary of the 2023 NPP data (n=7)



APH=antepartum haemorrhage; NPP=no previous pregnancy; PSE=potentially sensitising event; PVB=per vaginal bleeding; RAADP=routine antenatal anti-D Ig prophylaxis
**RAADP appointment was not arranged. Anti-D detected at 38 weeks gestation*
***Immune anti-D detected before 28 weeks gestation (at 11 weeks and 9 weeks gestation)*

Figure 27.3: Summary of the 2023 PP data (n=35)



APH=antepartum haemorrhage; IUD=intrauterine death; IV=intravenous; IVIg=intravenous immunoglobulin; PP=previous pregnancy; PSE=potentially sensitising event; PVB=per vaginal bleeding; RAADP=routine antenatal anti-D Ig prophylaxis
**In 1 case, the anti-D was detected at delivery in previous pregnancy but regarded as prophylactic. Detected at booking in the index pregnancy*
***No information provided of the gestation when pregnancy was terminated*
****D-variant, patient regarded as D-positive throughout pregnancy*
*****Patient moved to India*

Figure 28.1: Submitted confirmation reports 2014-2023

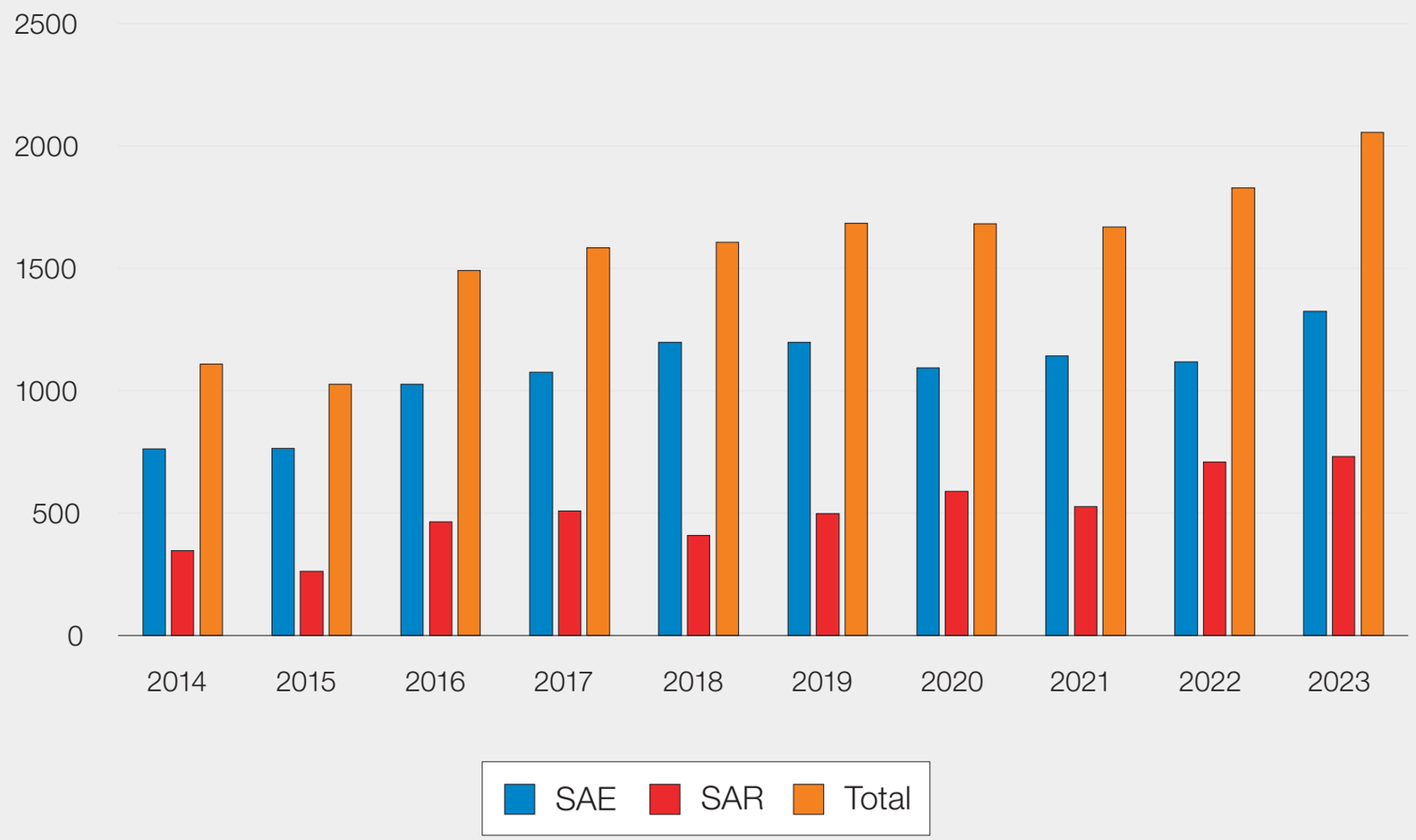
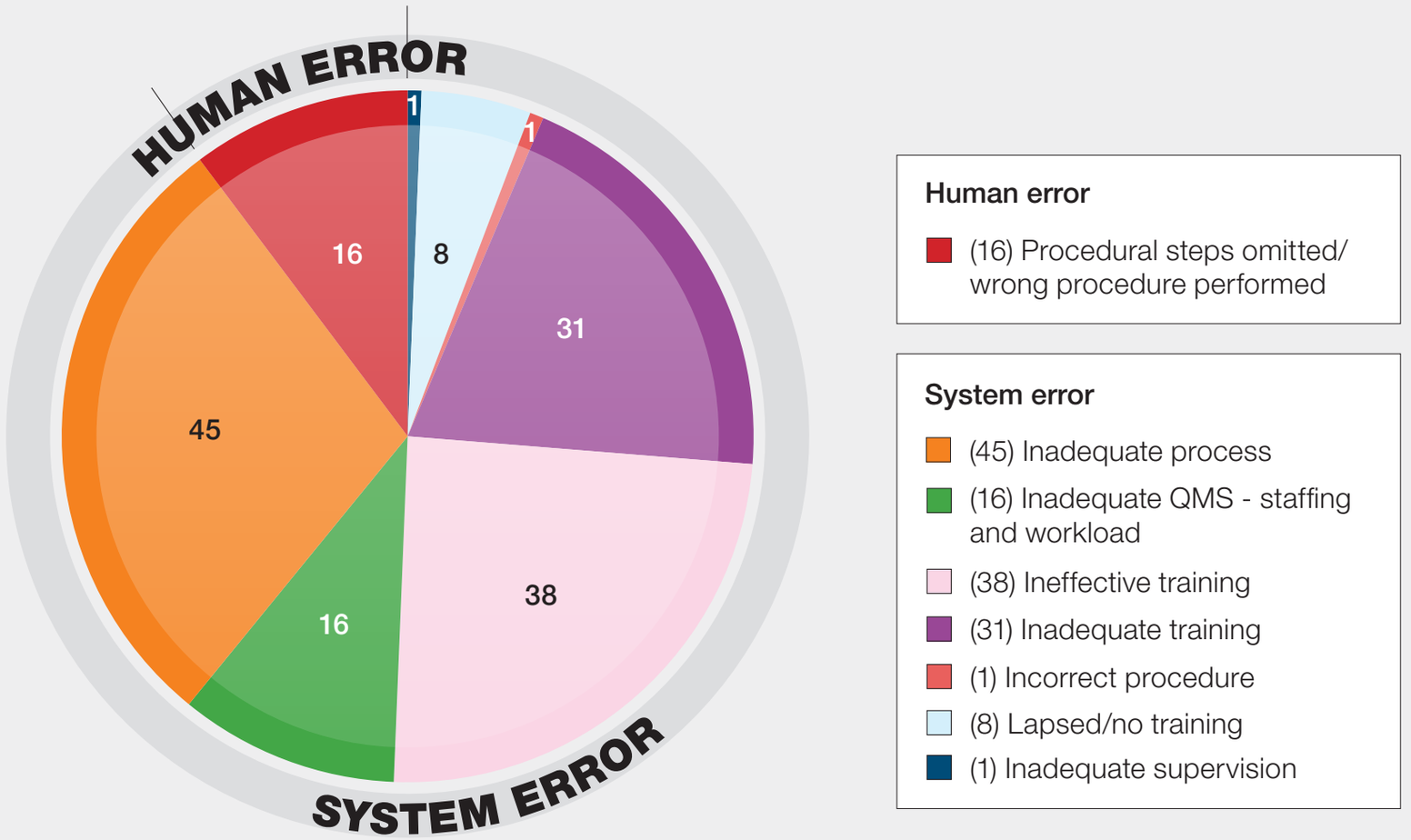
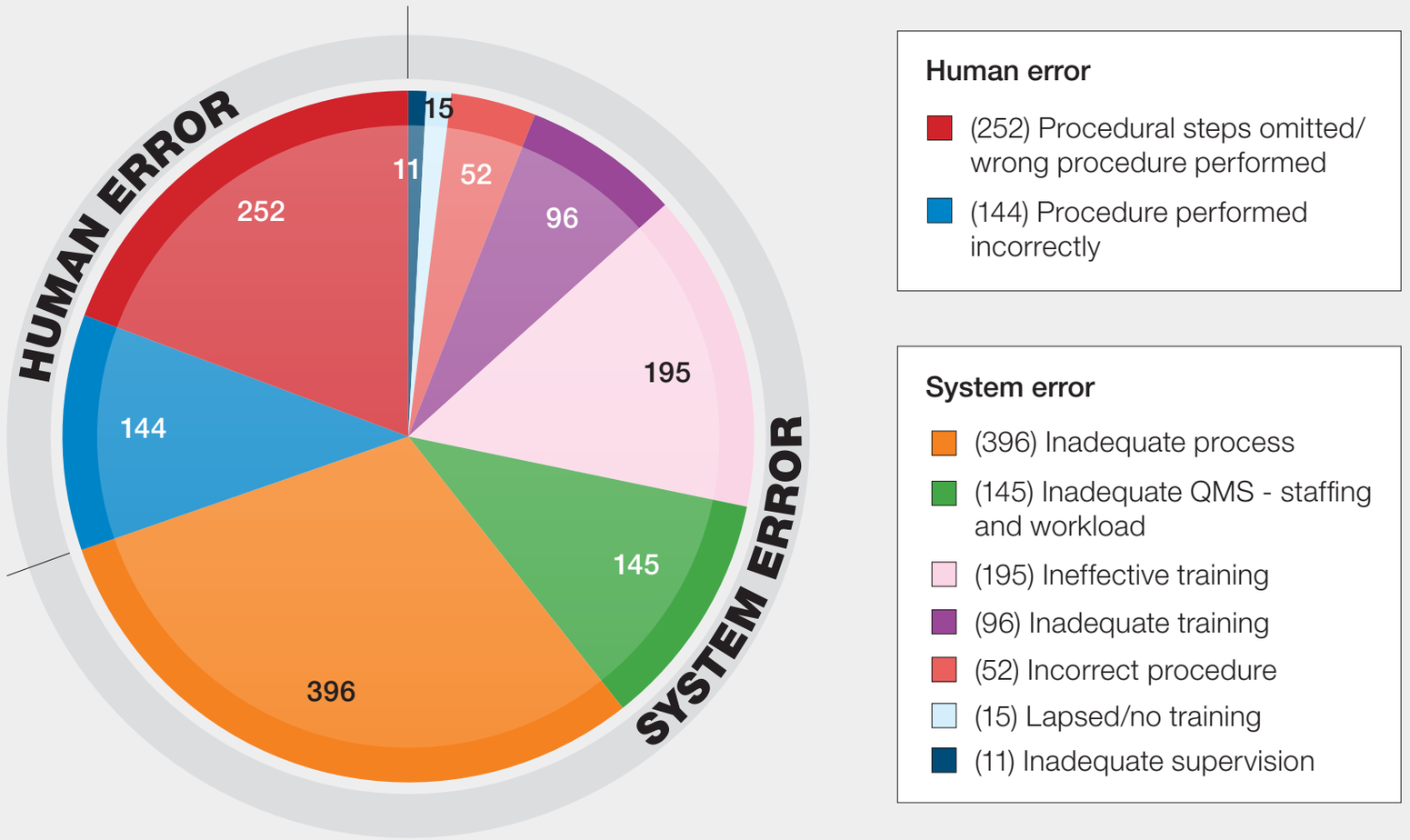


Figure 28.2 Root causes of incorrect storage of components sub-category (n=156)



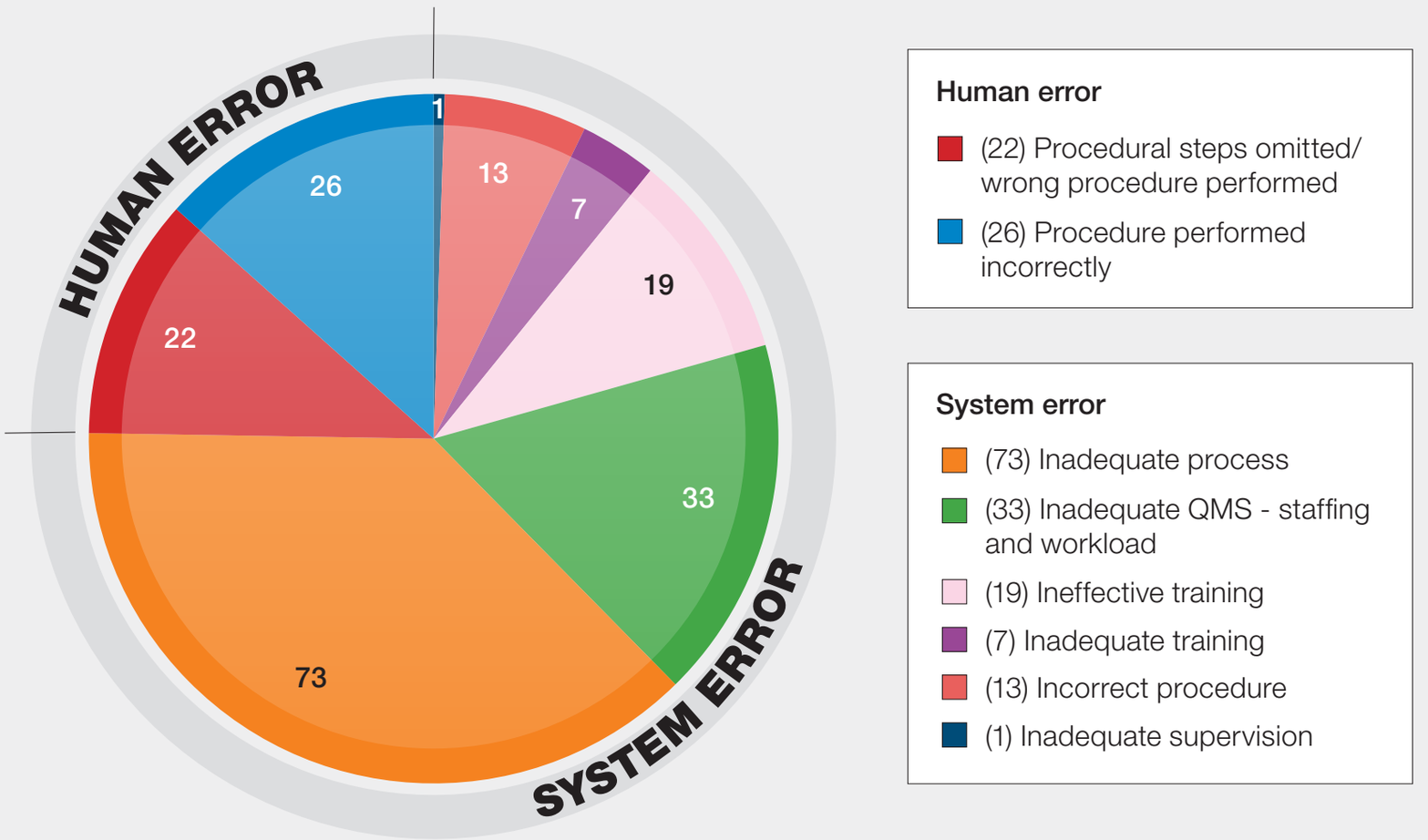
QMS=quality management system

Figure 28.3: Human/system error sub-categories (n=1306)



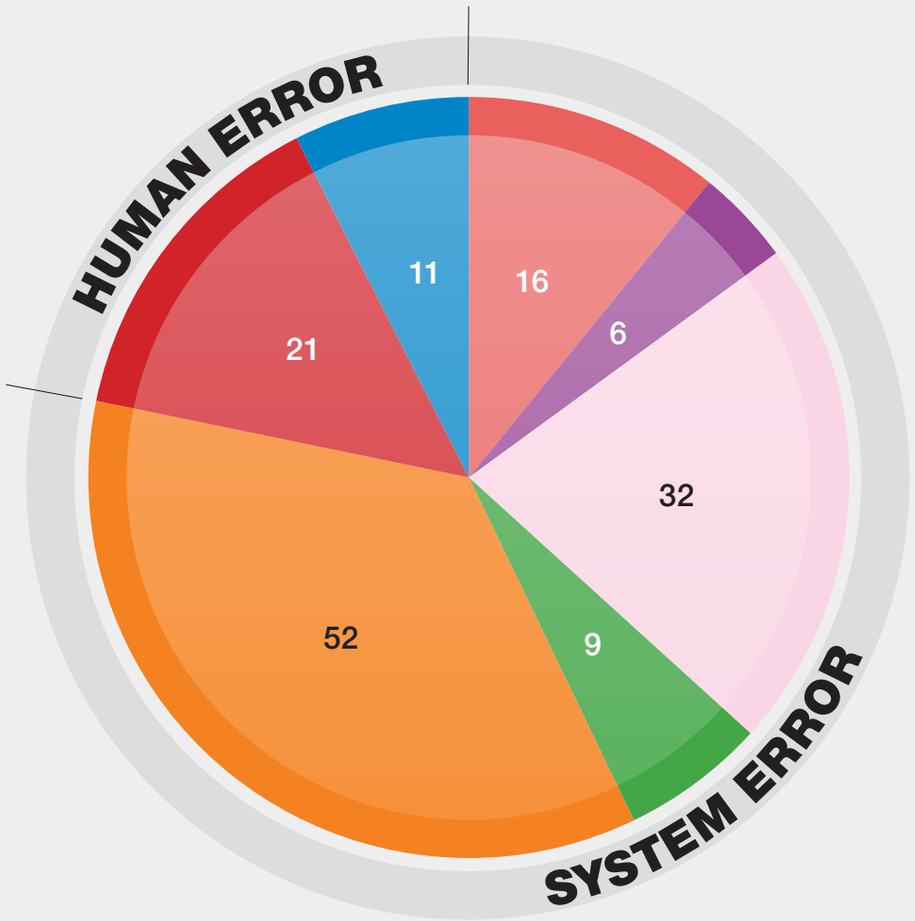
QMS=quality management system

Figure 28.4: Incorrect blood component issued - IBCI (n=194)



QMS=quality management system

Figure 28.5: Pre-transfusion testing error (PTTE) (n=148)



Human error

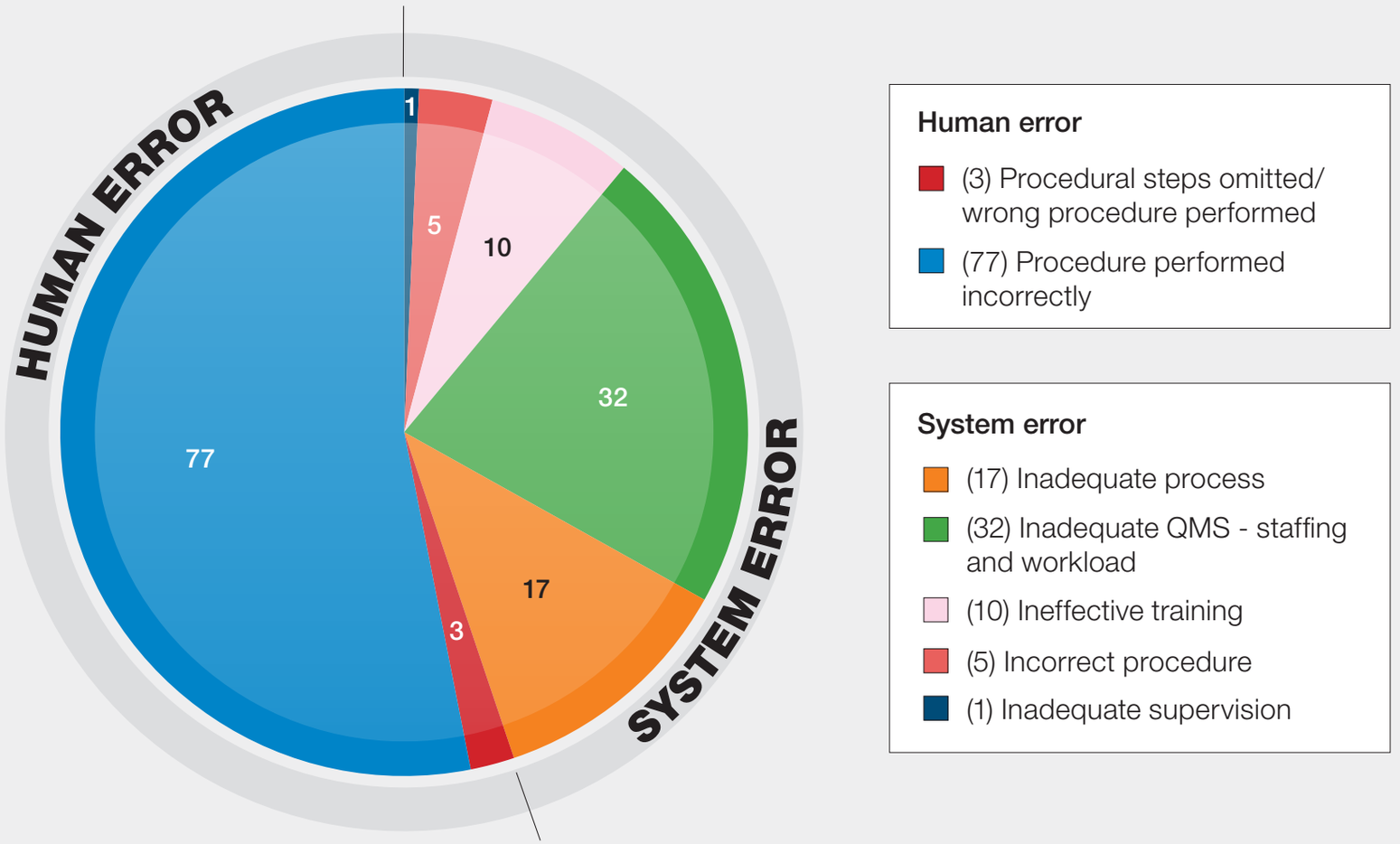
- (21) Procedural steps omitted/ wrong procedure performed
- (11) Procedure performed incorrectly

System error

- (52) Inadequate process
- (9 Inadequate QMS - staffing and workload
- (32) Ineffective training
- (6) Inadequate training
- (16) Incorrect procedure

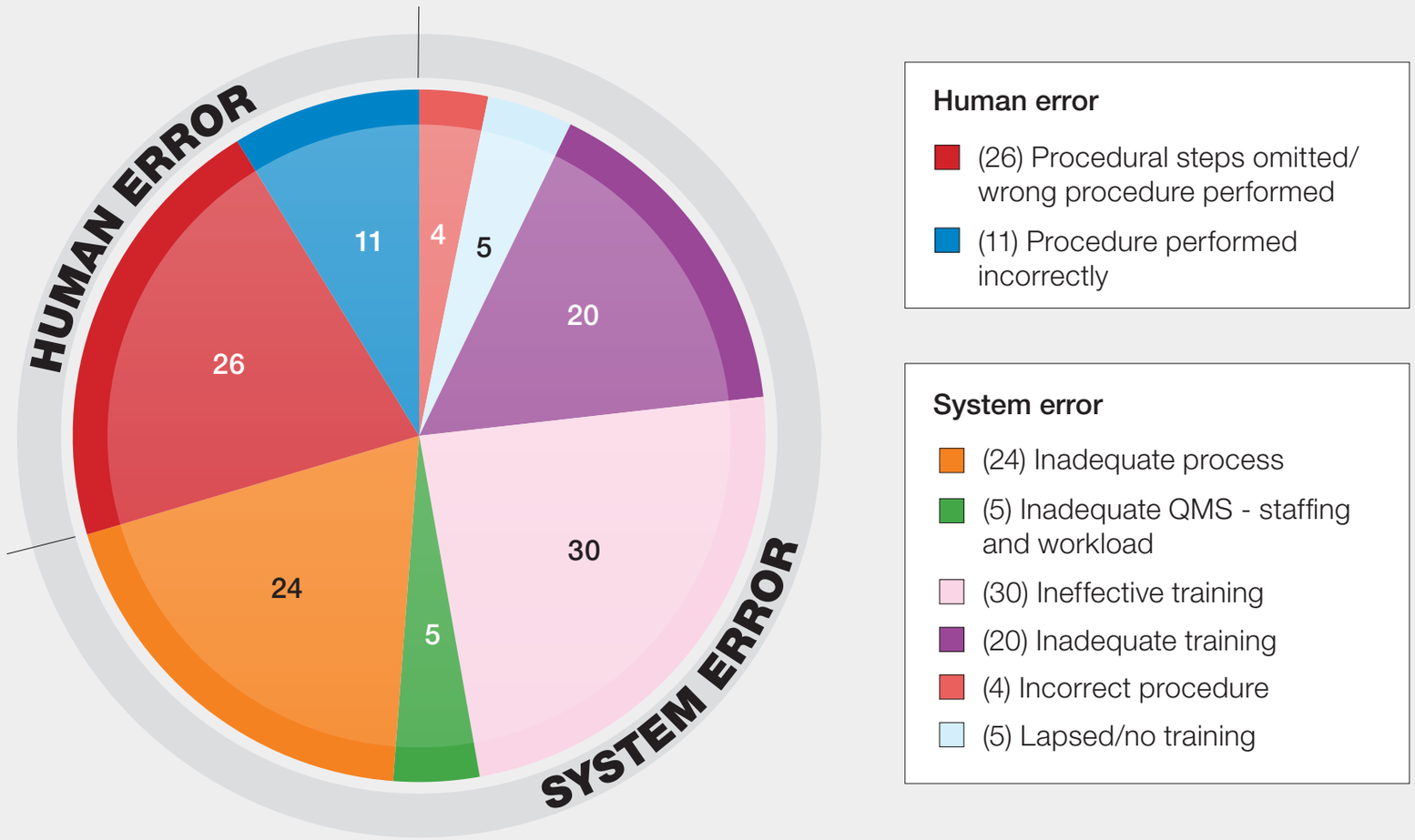
QMS=quality management system
1 equipment failure is not included in the figure

Figure 28.6: Sample processing error (SPE) (n=146)



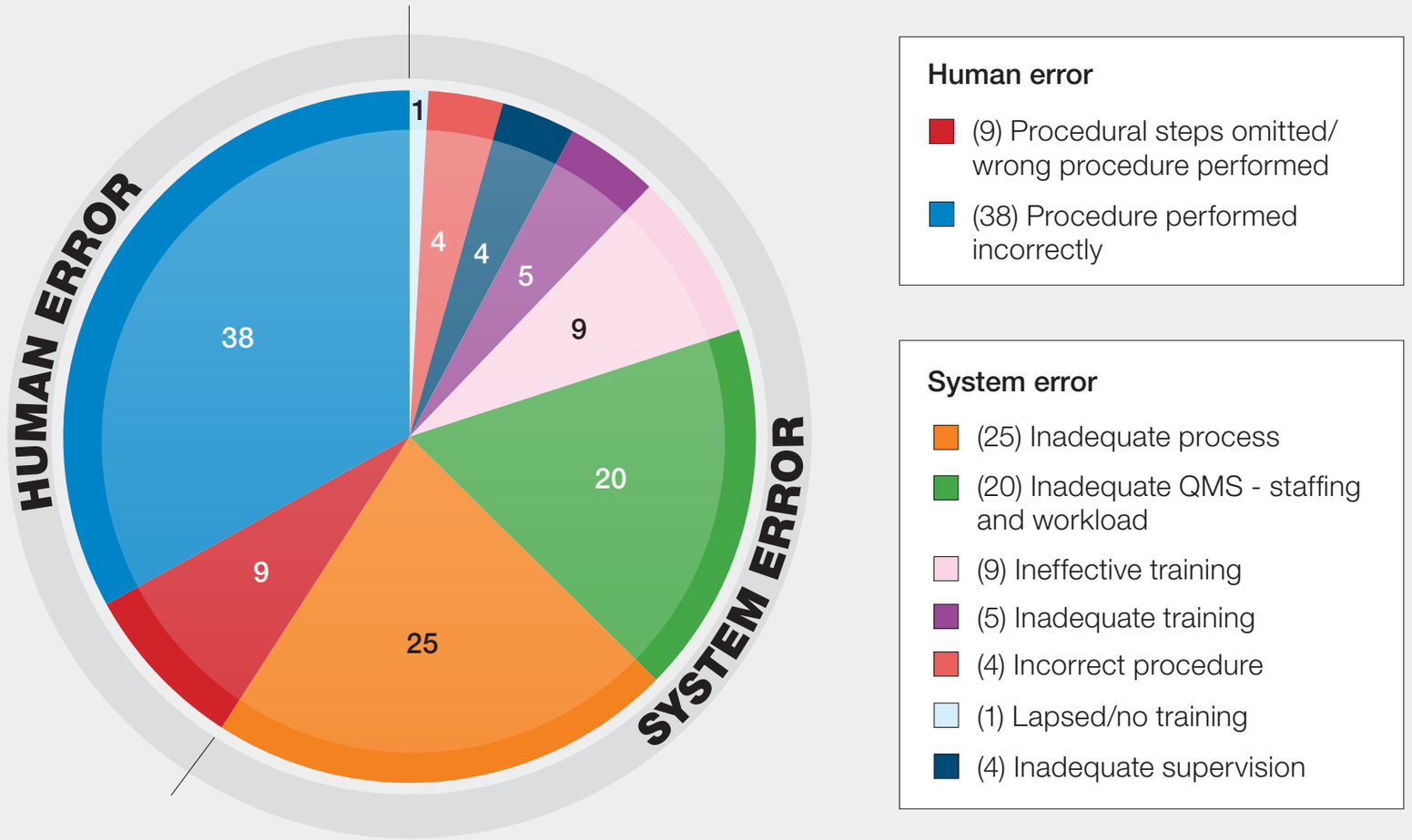
QMS=quality management system
1 equipment failure is not included in the figure

Figure 28.7: Component collection error (CCE) (n=127)



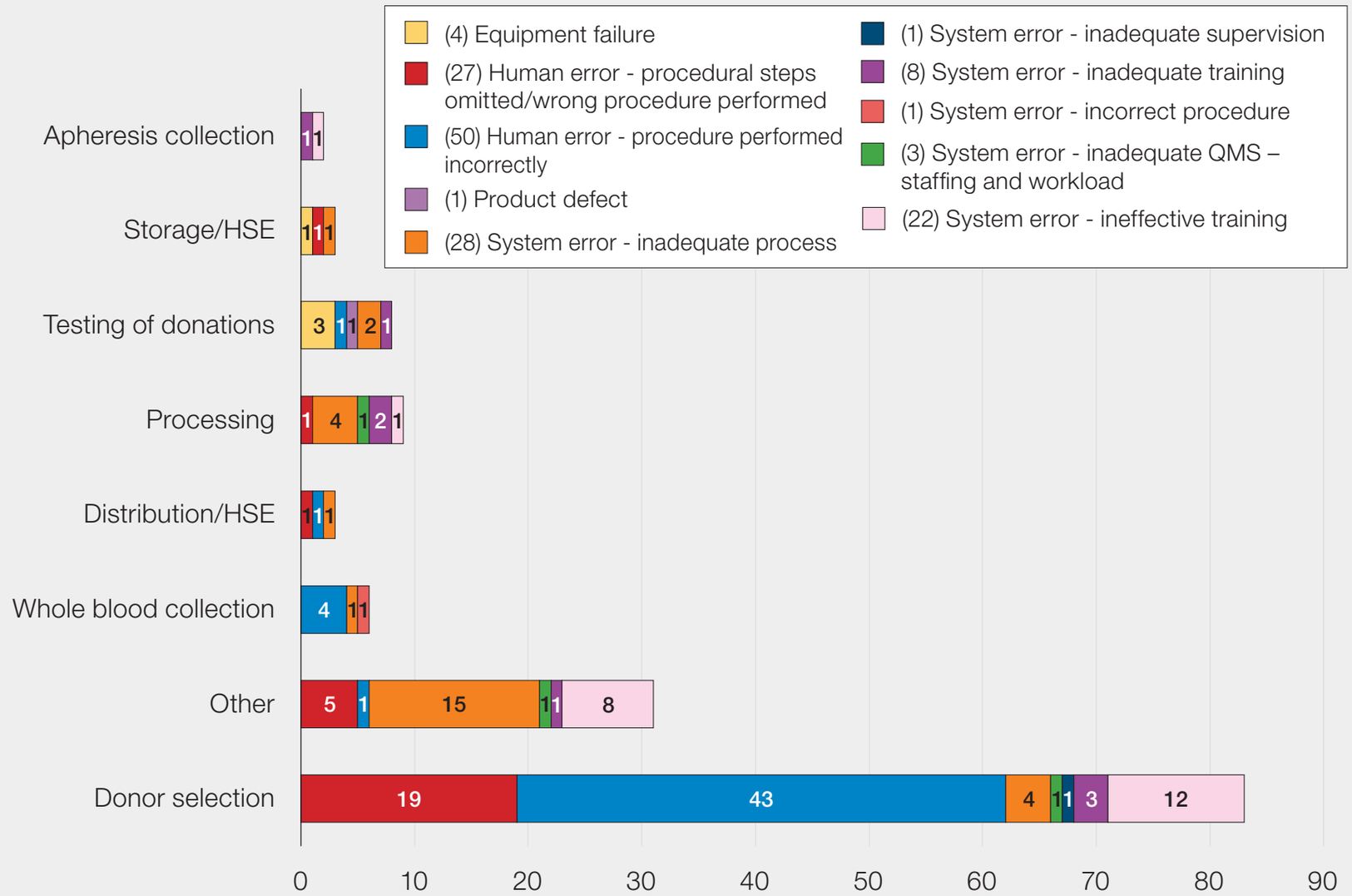
QMS=quality management system
2 equipment failures is not included in the figure

Figure 28.8: Component labelling error (CLE) (n=115)



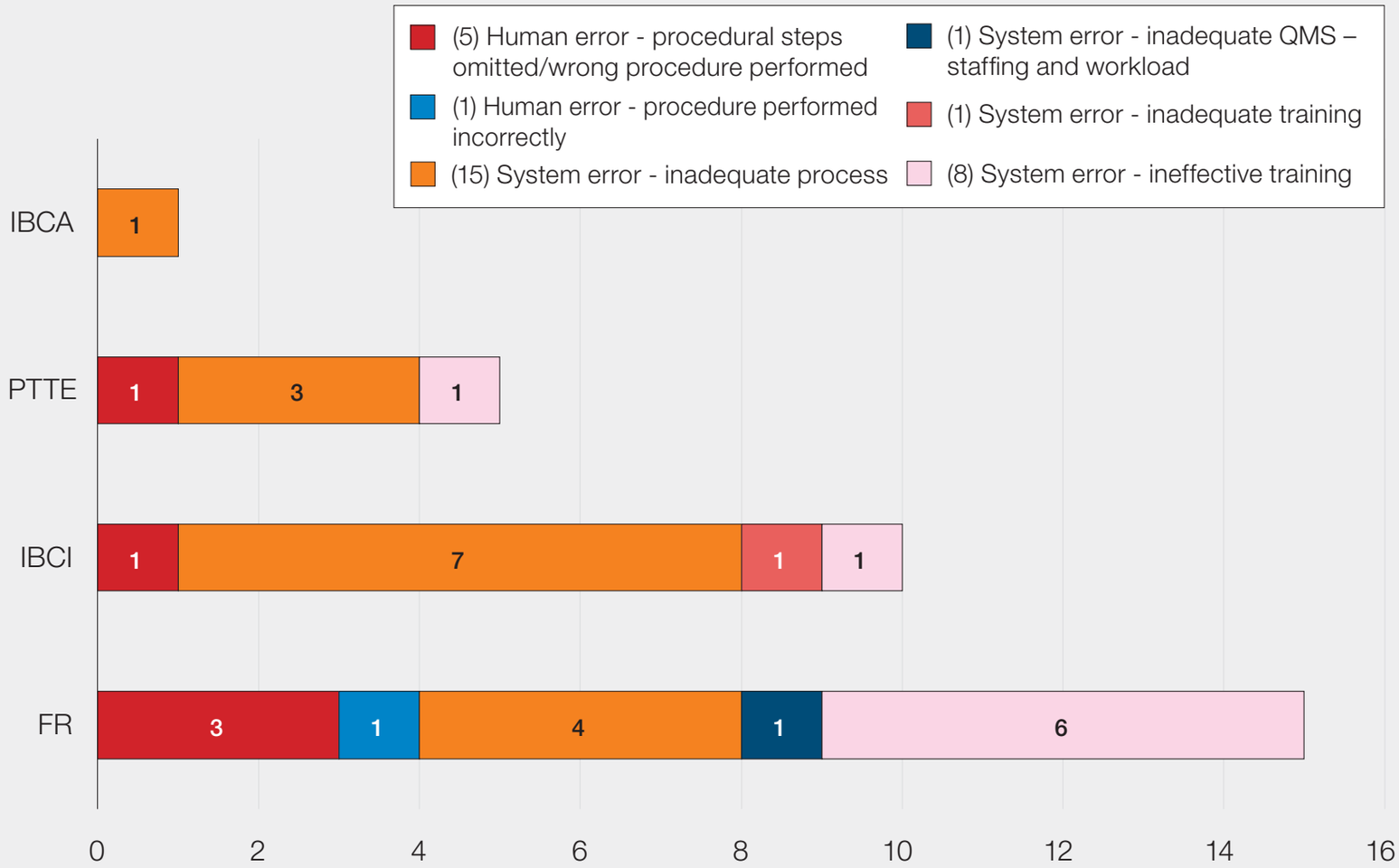
QMS=quality management system

Figure 28.9: Blood establishment SAE event category by specification (n=145)



QMS=quality management system; HSE=handling and storage errors

Figure 28.10: BE reports in ‘other’ category (n=31)



See Appendix 2 for key to category abbreviations
QMS=quality management system

Figure 28.11: SAR reports, by imputability, reported to SABRE in 2023