FIGURES FROM THE ANNUAL SHOT REPORT 2020

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SHOT Serious Hazards of Transfusion

Figure 2.1: SHOT reporting by month during 2020

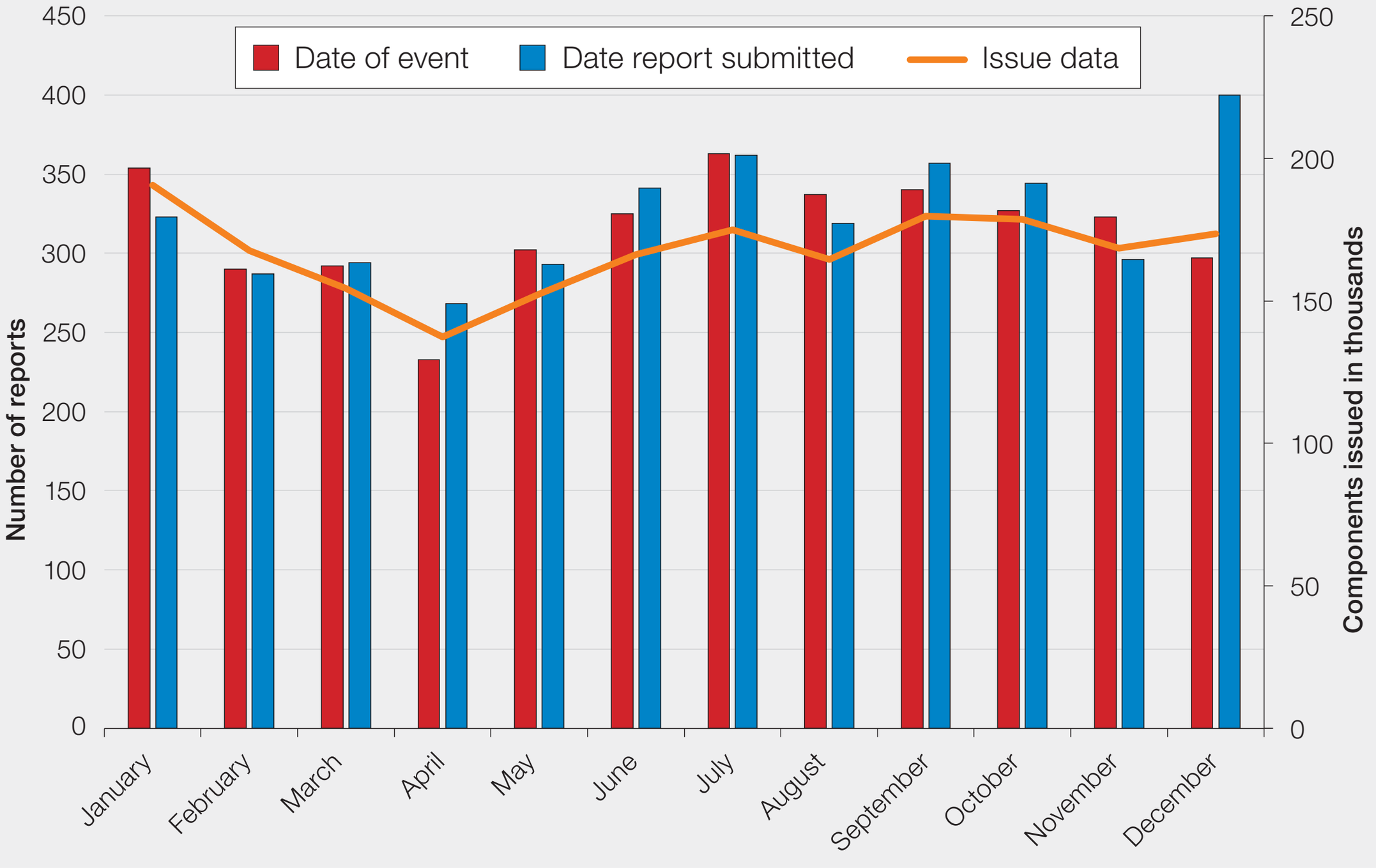


Figure 2.2: Status of reports submitted to SHOT in the calendar year 2020

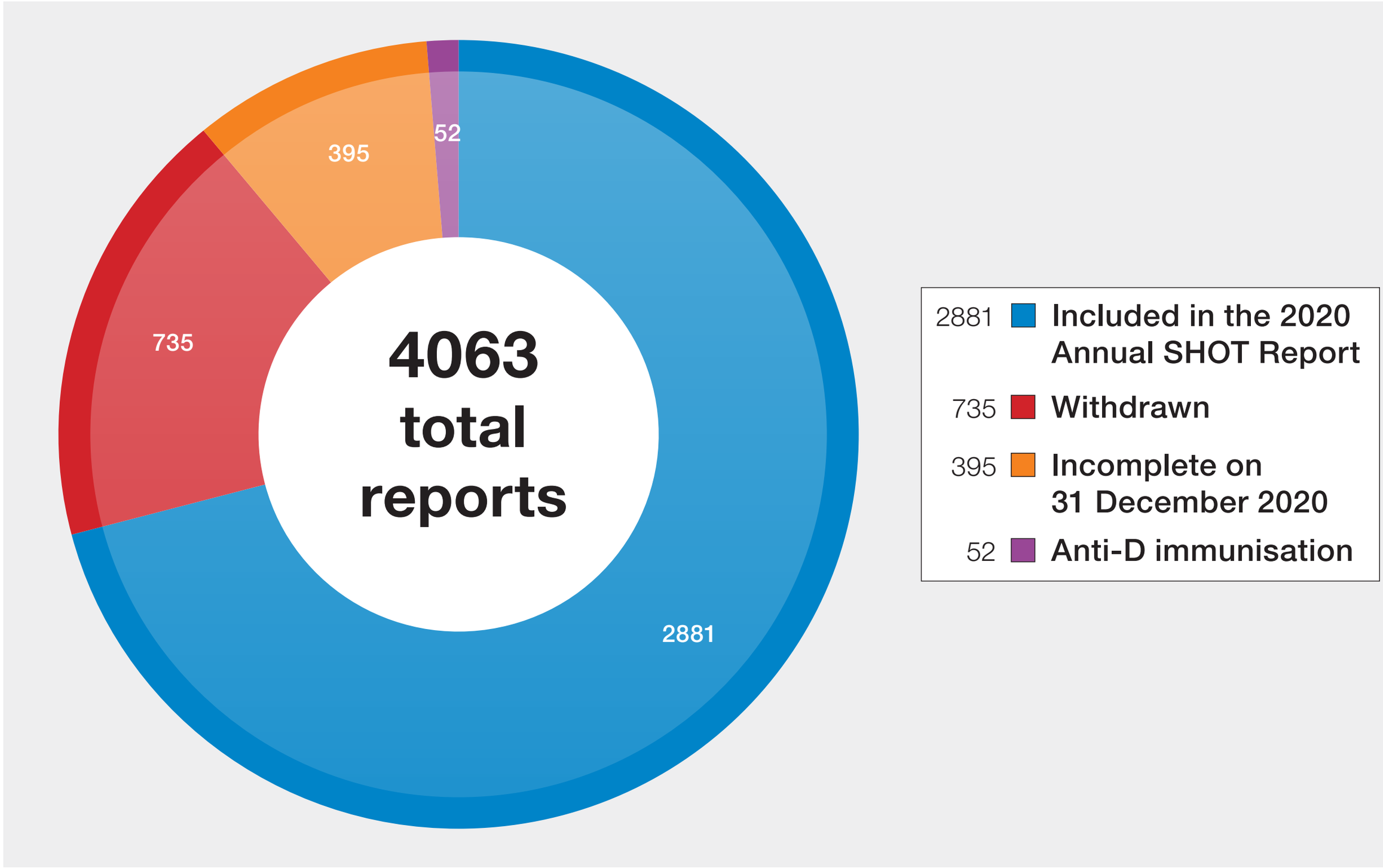


Figure 2.3: Ten years of reporting by non-NHS organisations 2011-2020

Figure 2.4: The last time a report was received on SABRE from an active SABRE account

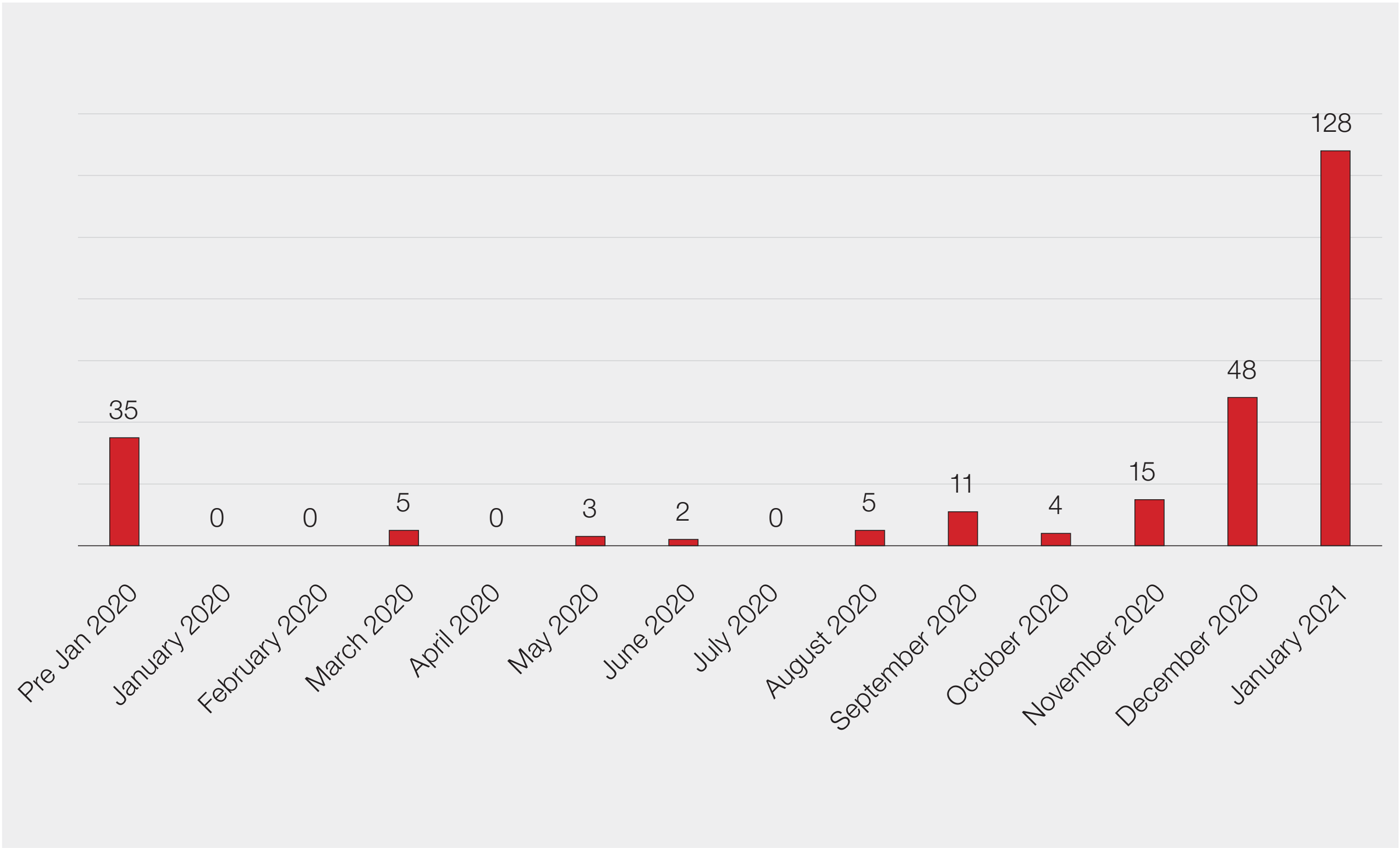


Figure 2.5: Percentage of SHOT reports analysed by UK country (excluding CCP)

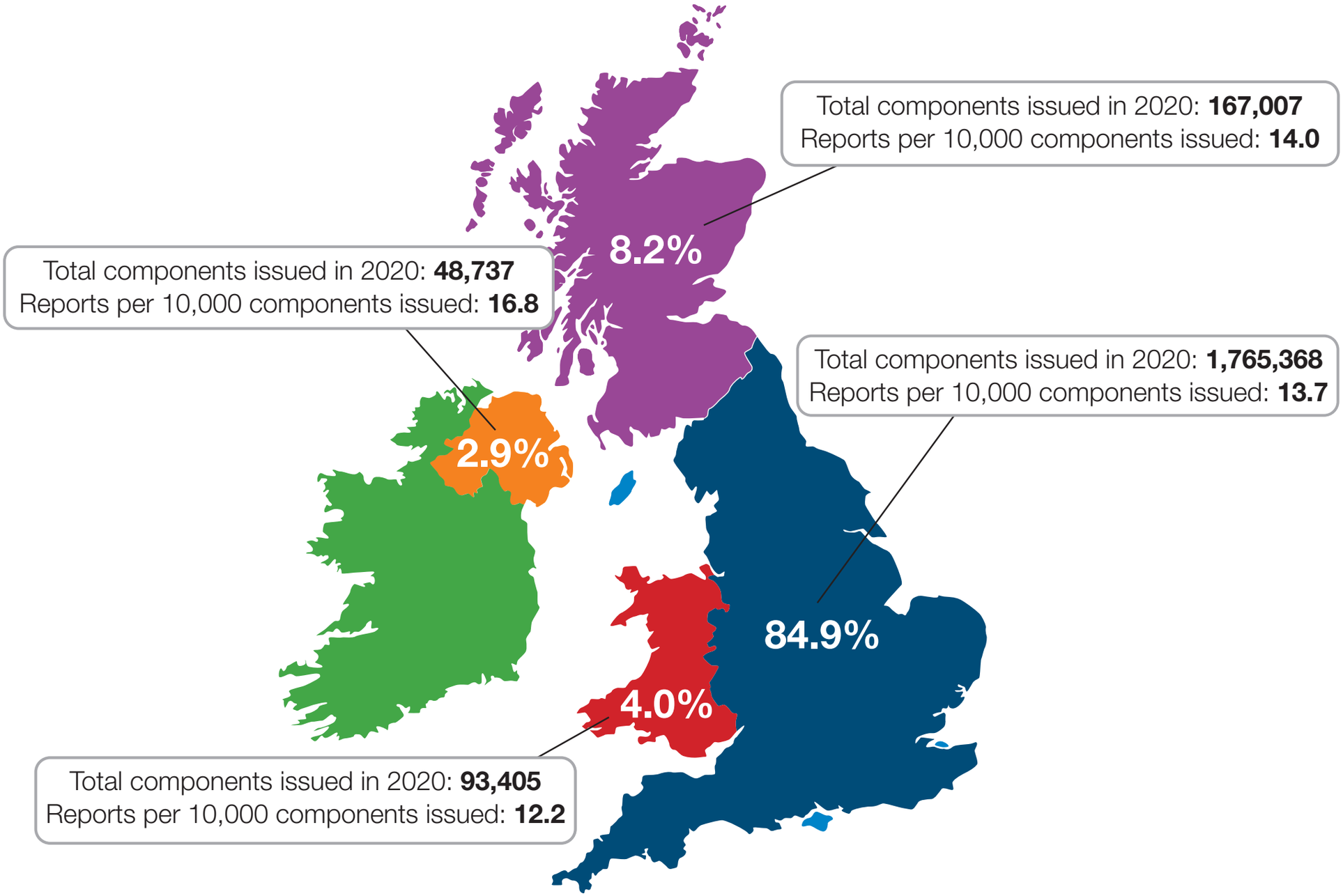


Figure 2.6: Trend of error reports from different departments

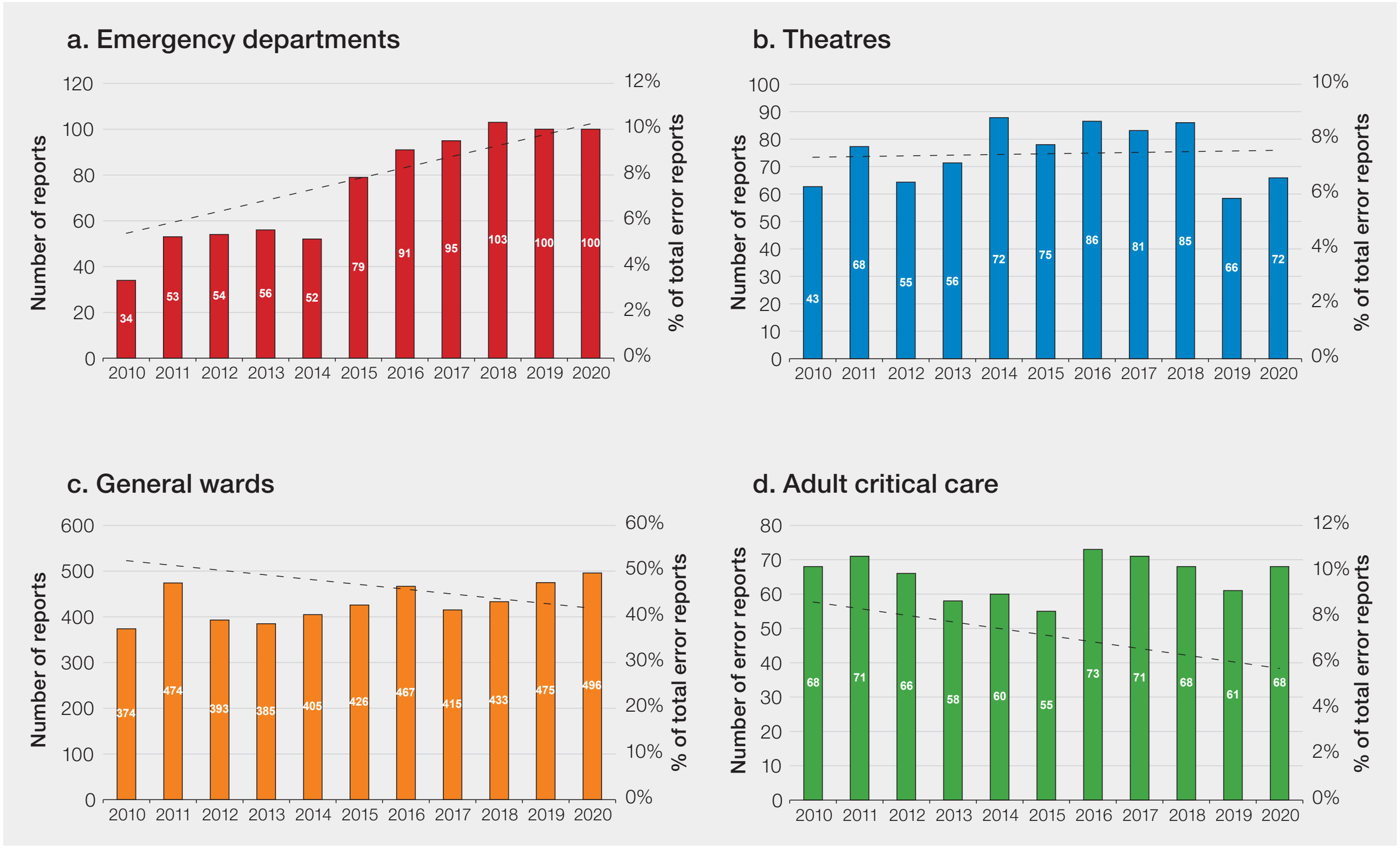


Figure 2.7: Using SHOT participation benchmarking data to drive improvements

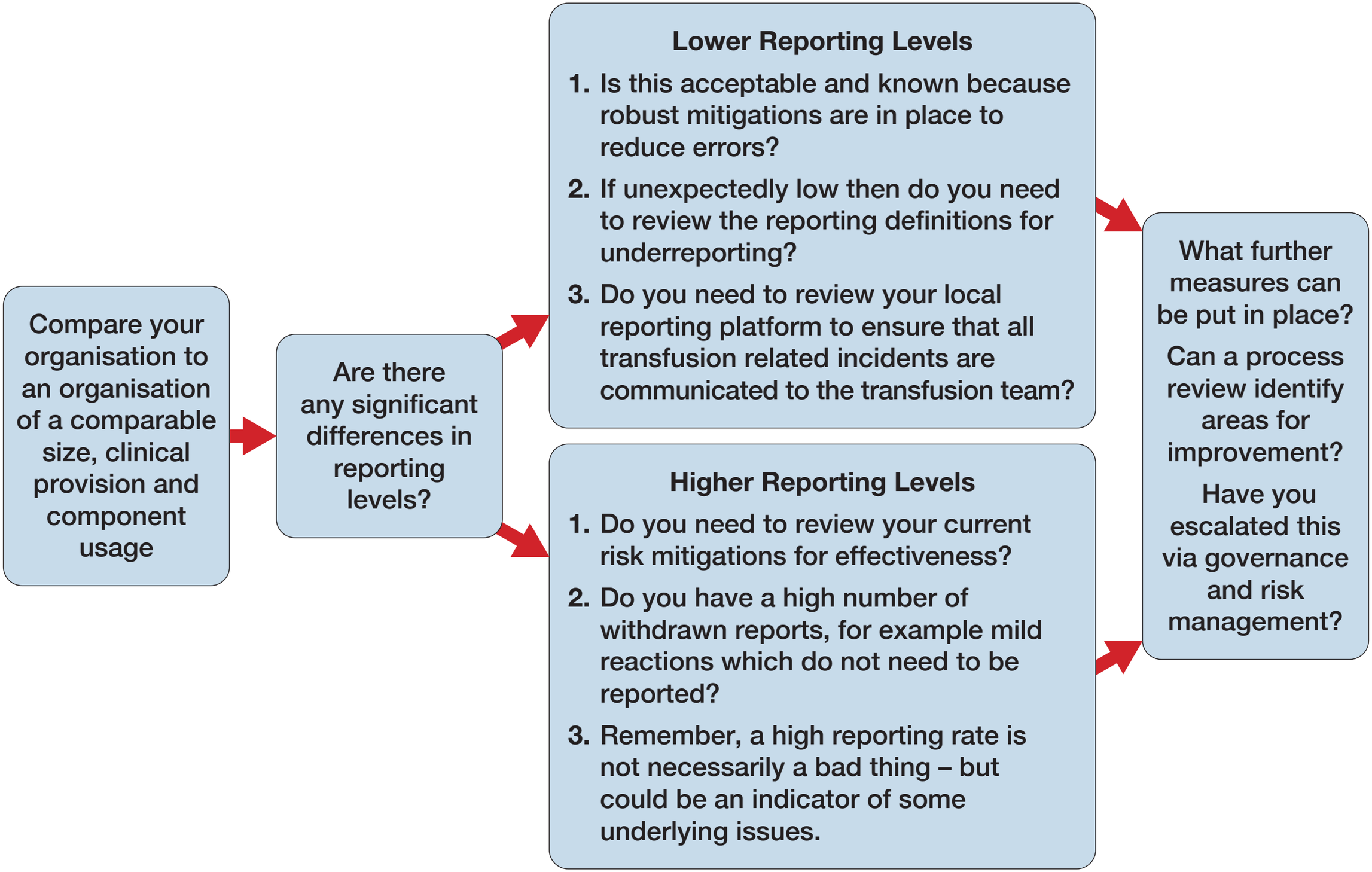
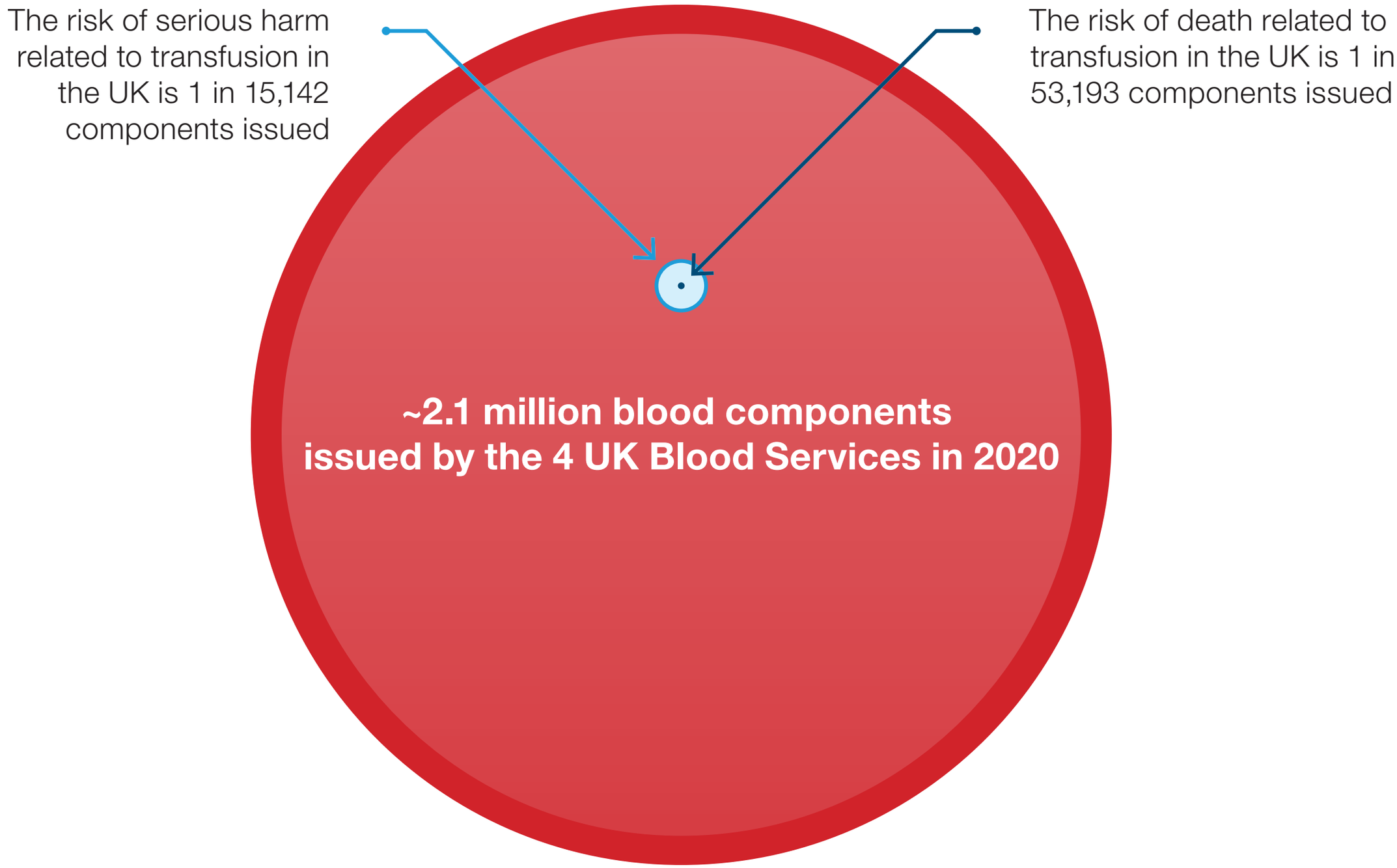


Figure 3.1: Risk of death and serious harm relating to transfusions in the UK in 2020



Note: This is a representative image and not accurate to scale

Figure 3.2: Errors account for most reports: 2623/3214

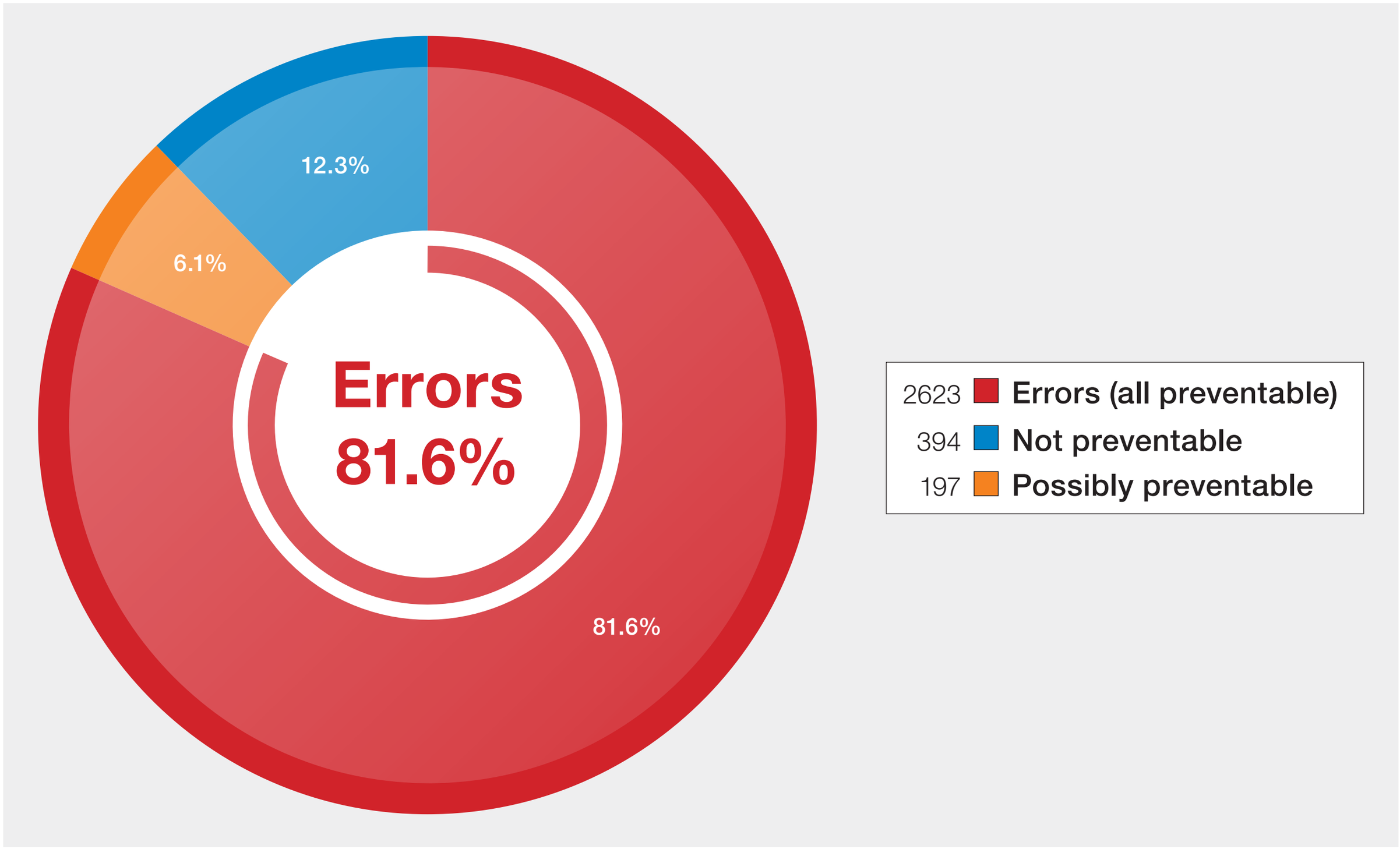


Figure 3.3: Errors as a percentage of total reports 2014-2020

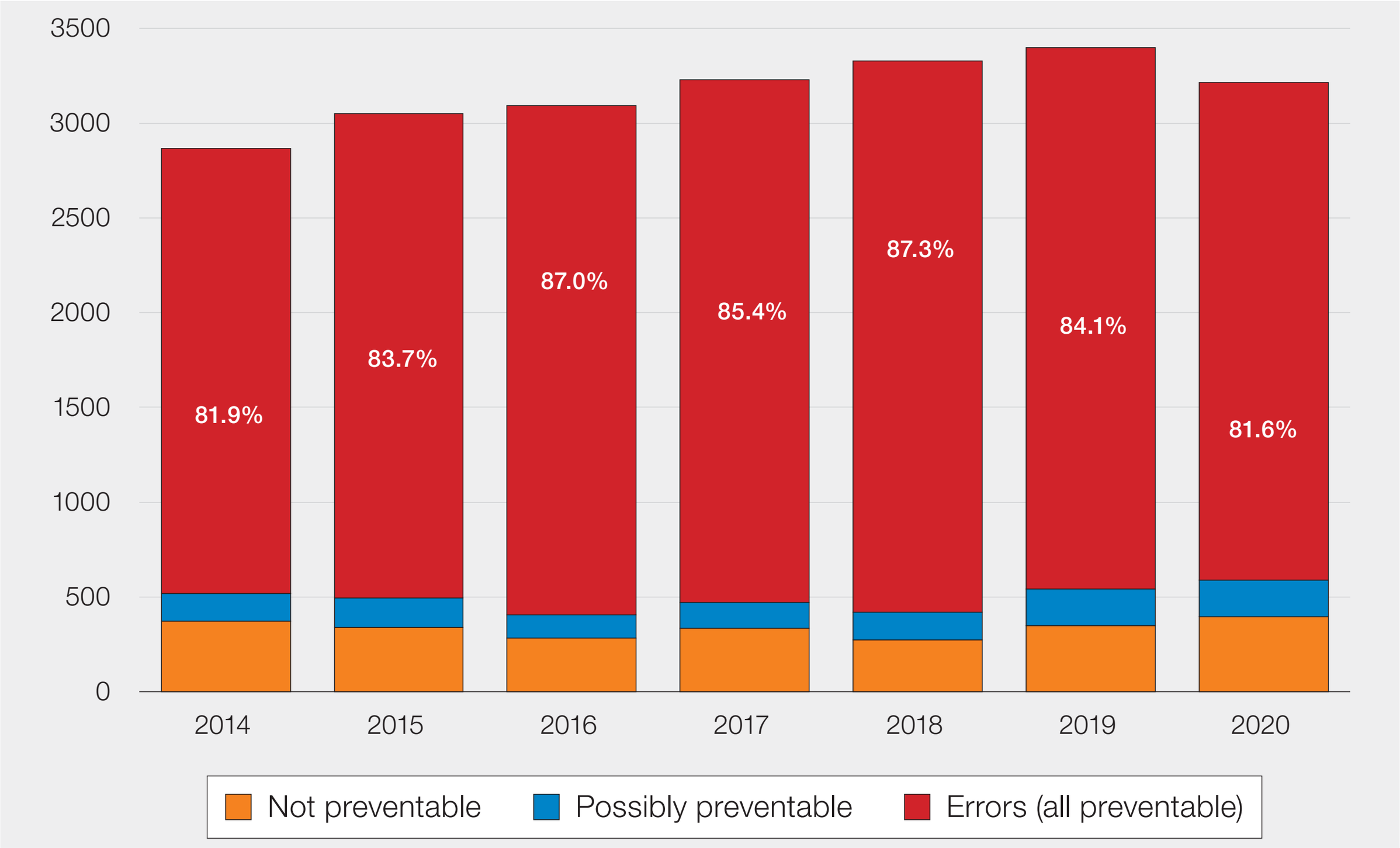
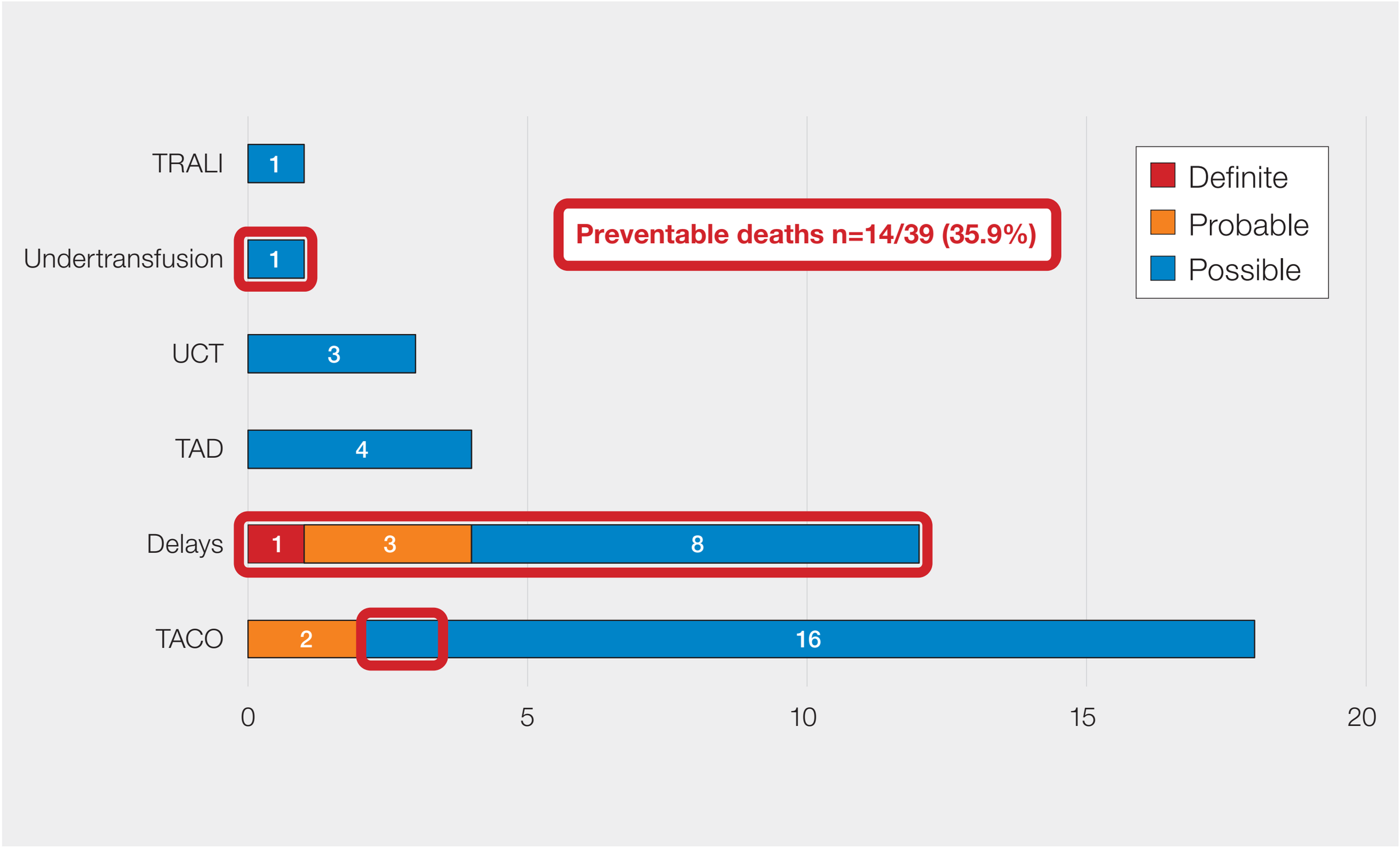
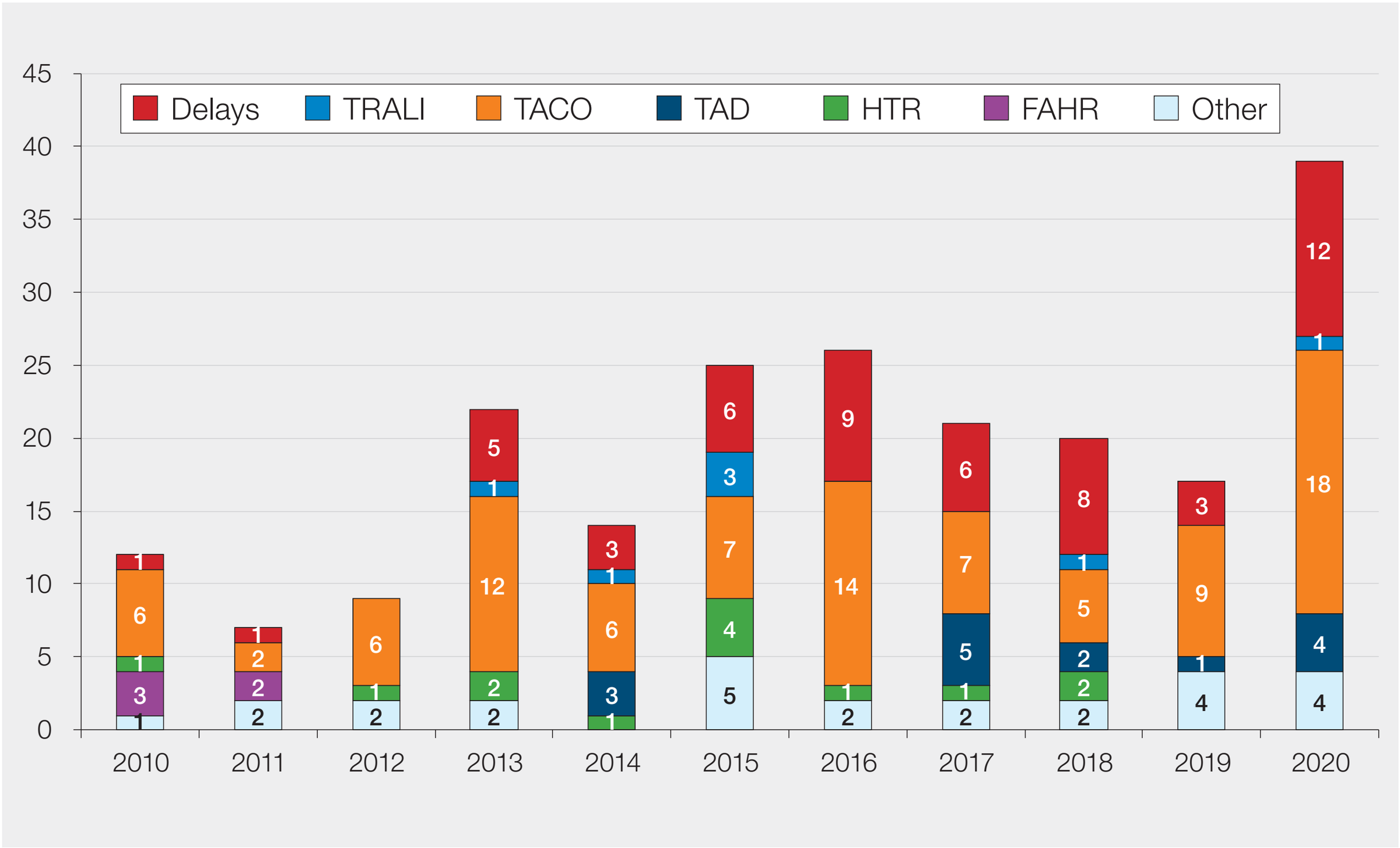


Figure 3.4: Deaths related to transfusion (with imputability) reported in 2020 (n=39)



TRALI=transfusion-related acute lung injury; UCT=uncommon complications of transfusion; TAD=transfusion-associated dyspnoea; TACO=transfusion-associated circulatory overload

Figure 3.5: Transfusion-related deaths 2010 to 2020 (n=173)



TRALI=transfusion-related acute lung injury; TACO=transfusion-associated circulatory overload; TAD=transfusion-associated dyspnoea; HTR=haemolytic transfusion reaction; FAHR=febrile, allergic and hypotensive reactions

Please refer to the respective Annual SHOT Reports for further details regarding these deaths.

Figure 3.6: Summary data for 2020, all categories (includes RBRP and NM) (n=3214)

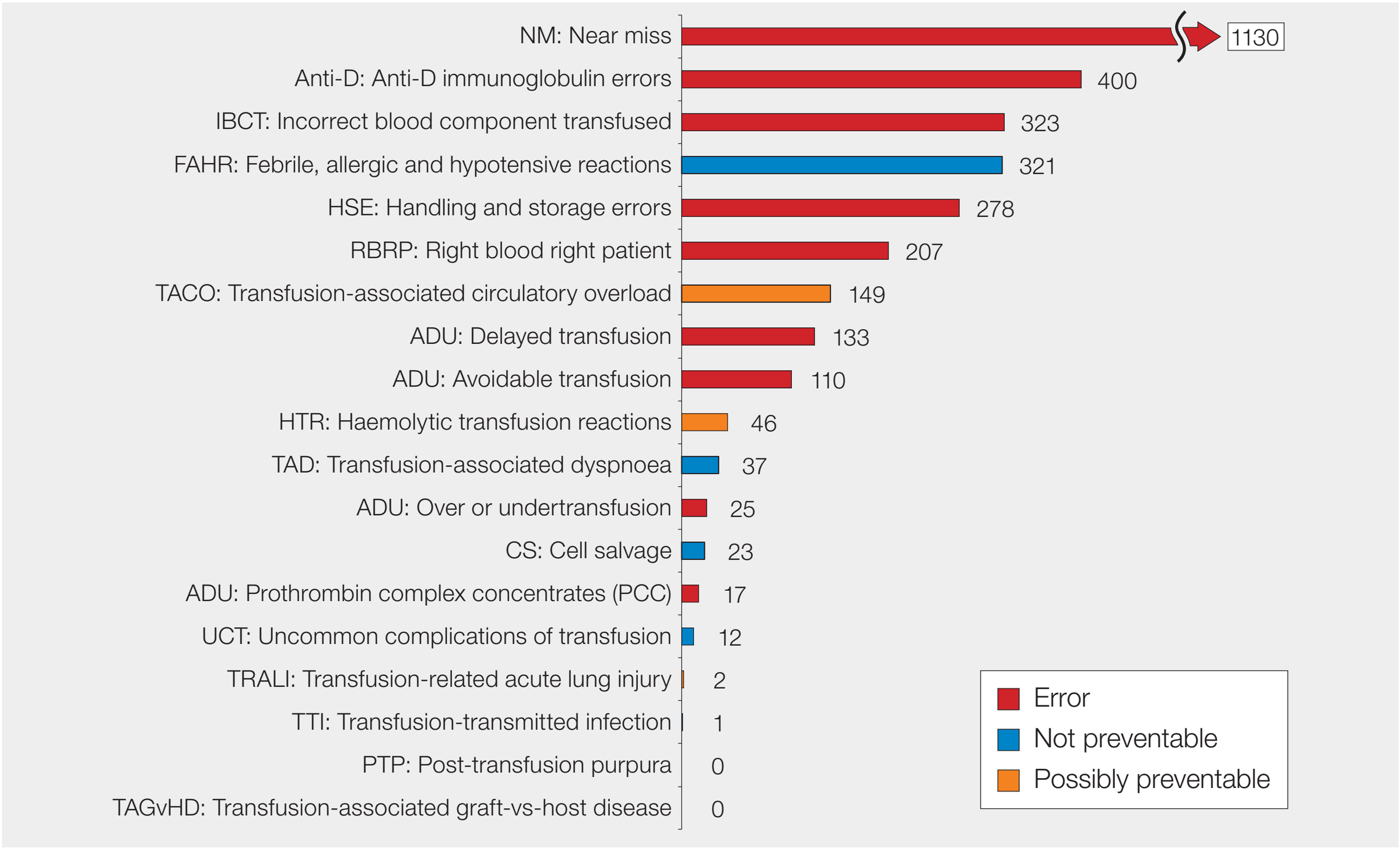
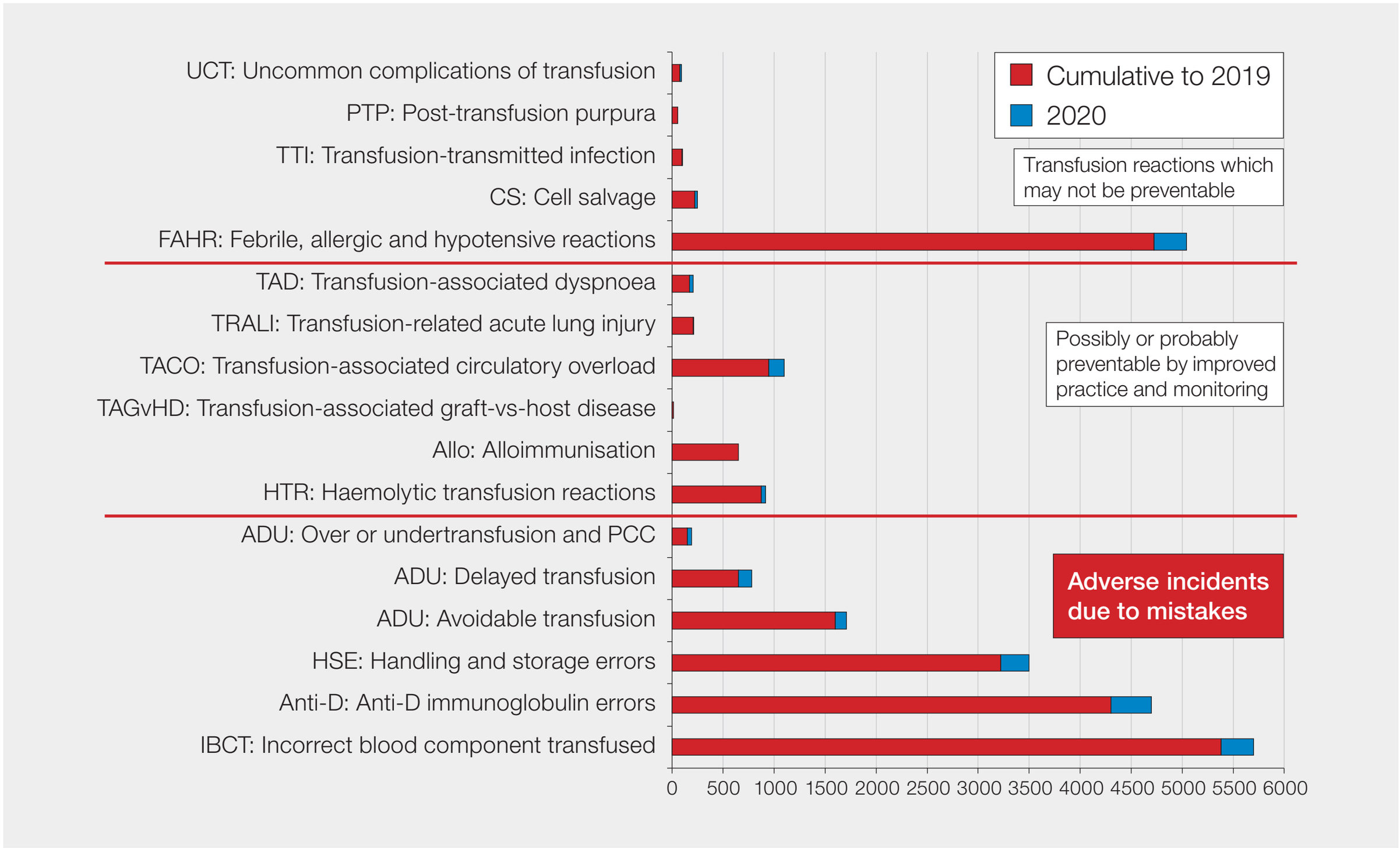
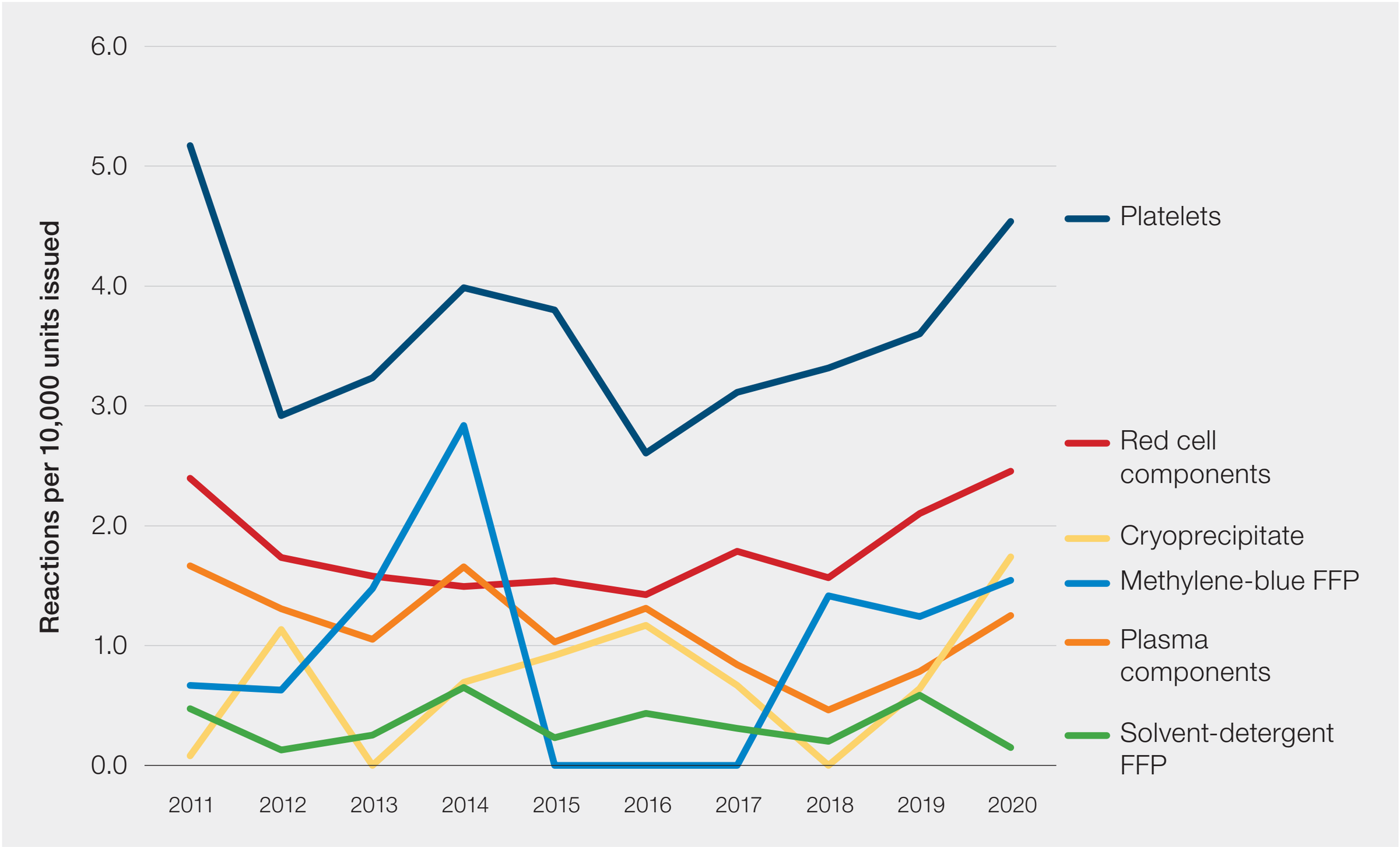


Figure 3.7: Cumulative data for SHOT categories 1996-2020 (n=25218)



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

Figure 3.8: Reactions per 10,000 components, by component type 2011-2020



*Not including convalescent plasma

Figure 3.9: Number of ABO-incompatible red cell transfusions 1996-2020

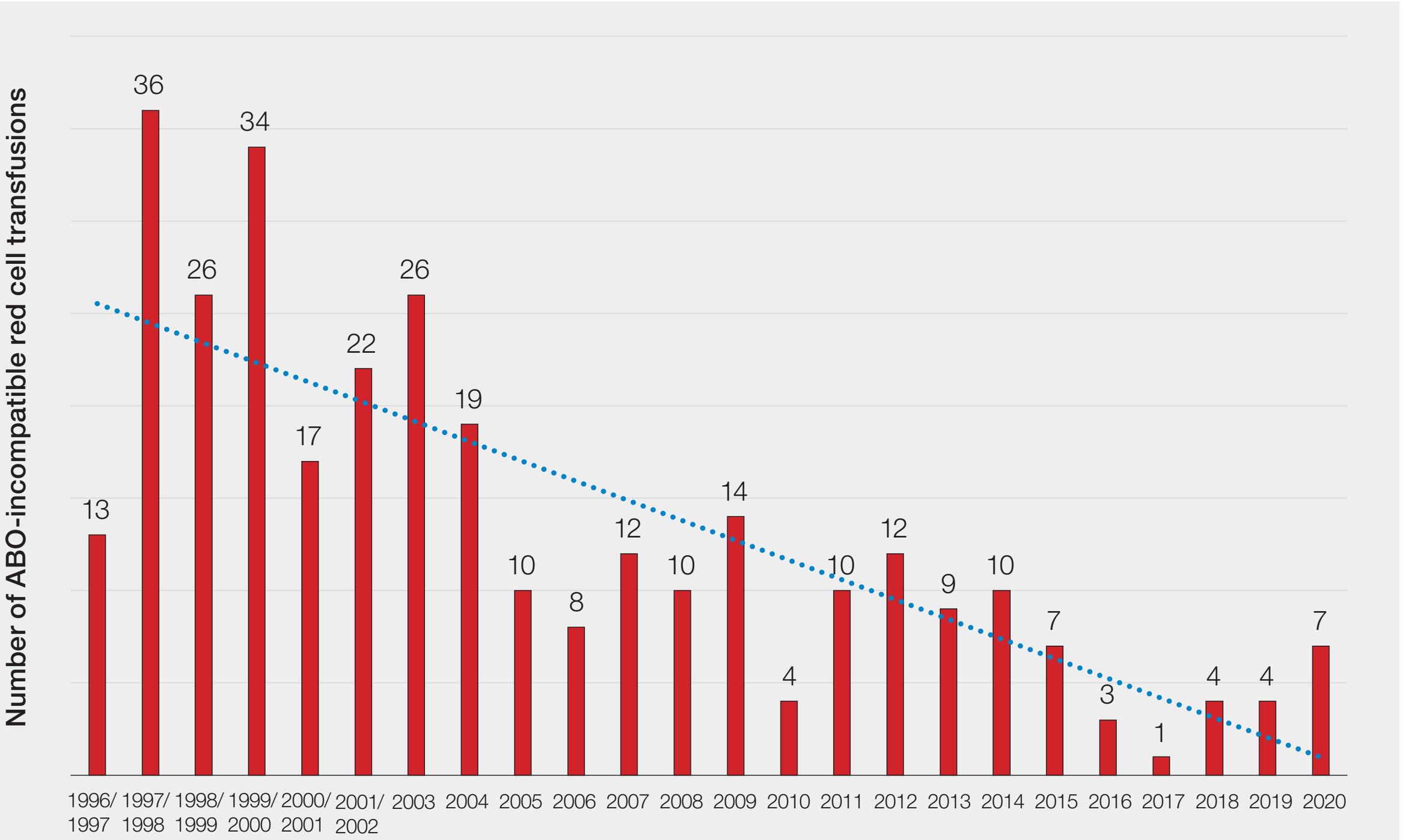


Figure 3.10: ABO incompatible red cell transfusions from 2010 to 2020 showing the importance of the pre-administration checks

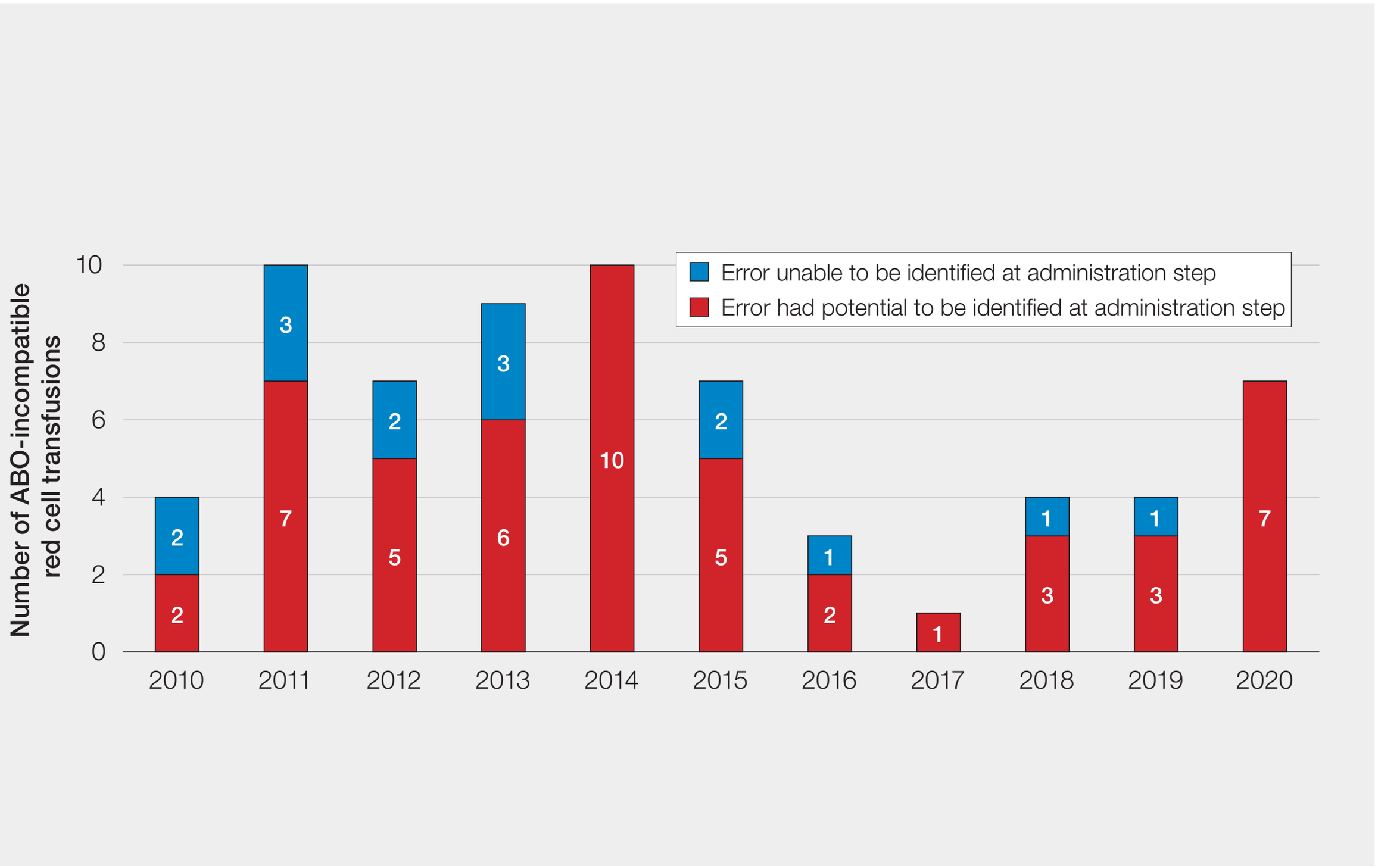


Figure 3.11: ABO-incompatible transfusions 2016-2020: few events (n=19) but many near misses (n=1495)

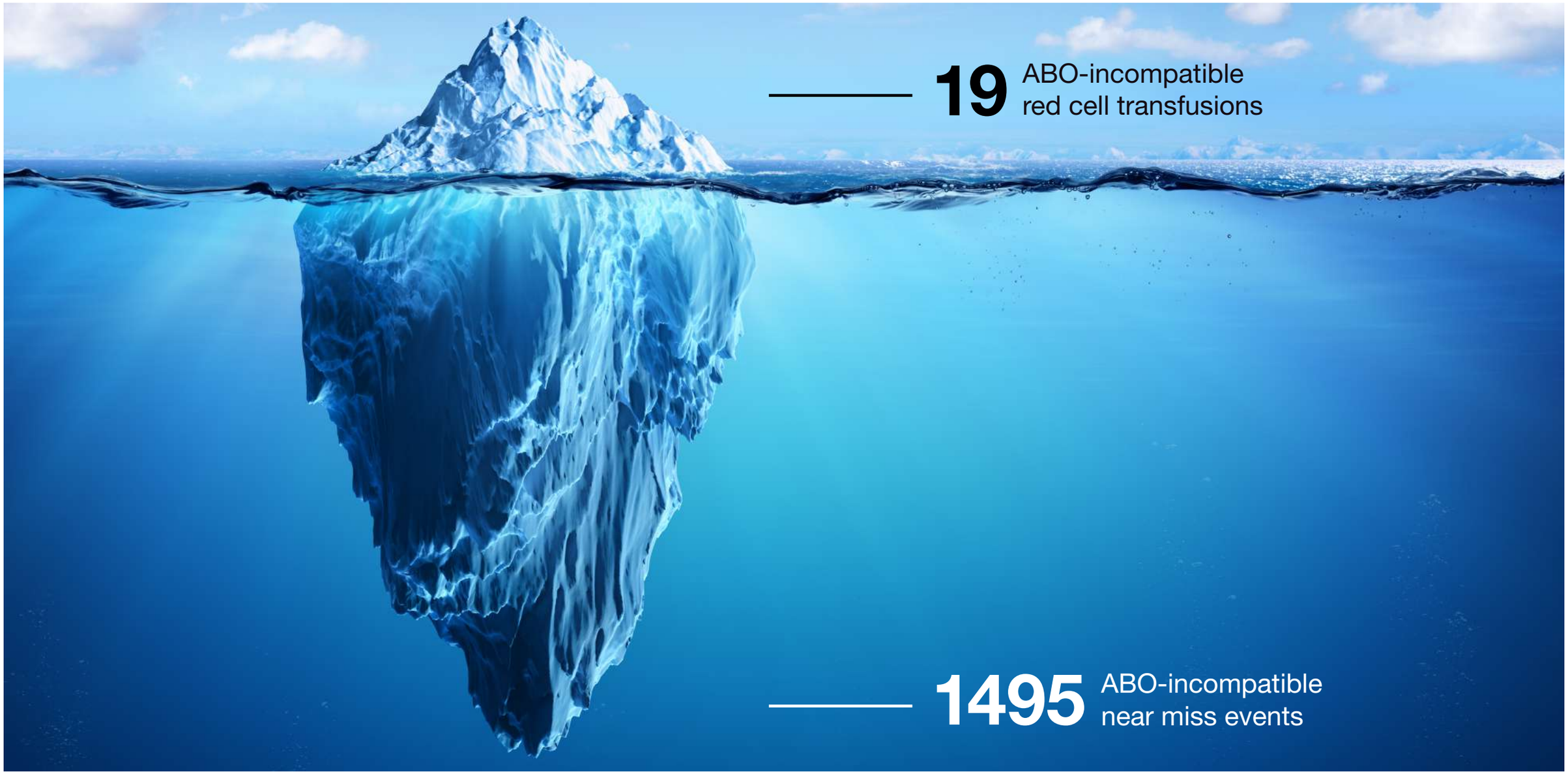


Figure 4.1: Ten steps in transfusion

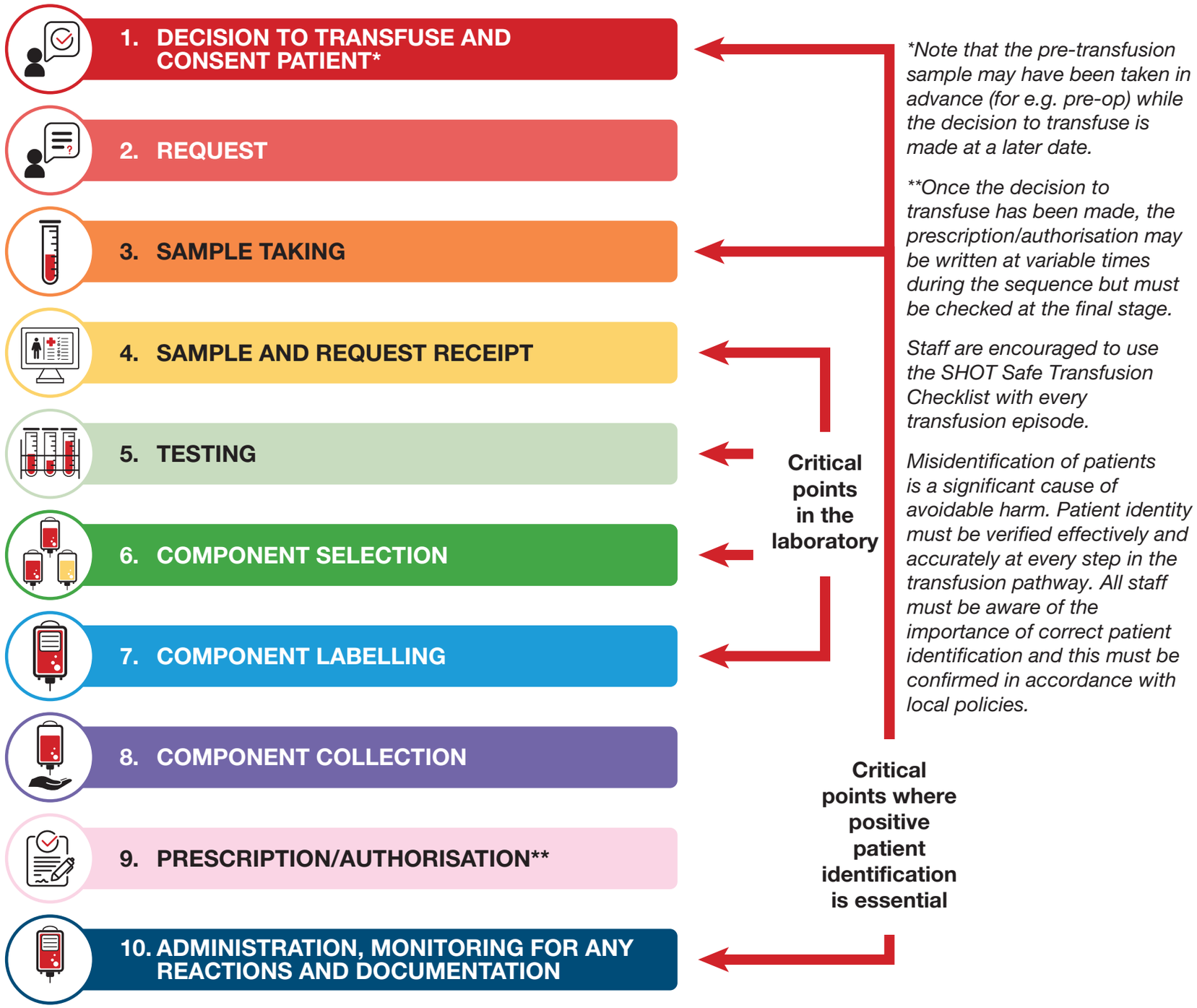


Figure 4.2: The A-E Decision Tree to facilitate decision making in transfusion

A

Assess patient
Any avoidable blood loss
(frequent, unnecessary tests/interventions)

B

Blood results (all) reviewed including trends – valid and reliable?
Best treatment option—is transfusion the best treatment option? If yes, what components needed, how many, what order and any specific requirements needed?

C

Consent/communication (adequate patient information—both verbal and written) to patients and where appropriate to families and carers
Correctable factors to be addressed like bleeding, haematinic deficiency

D

Do not forget other measures (vitamin K, tranexamic acid, cell salvage, etc)
Do not hesitate to question colleagues regarding decisions made and ask for rationale
Do not forget to document in patient's notes and in discharge summaries

E

Ensure timely communications to laboratory- need to be clear, concise and accurate
Ensure all relevant transfusion checklists including TACO risk assessment and actions arising thereafter have been completed
Evidence based decisions made weighing risks, benefits and options available
Ensure patient receives adequate post-transfusion information if transfusion given as a day case

Figure 4.3: Factors contributing to transfusion delays in bleeding patients

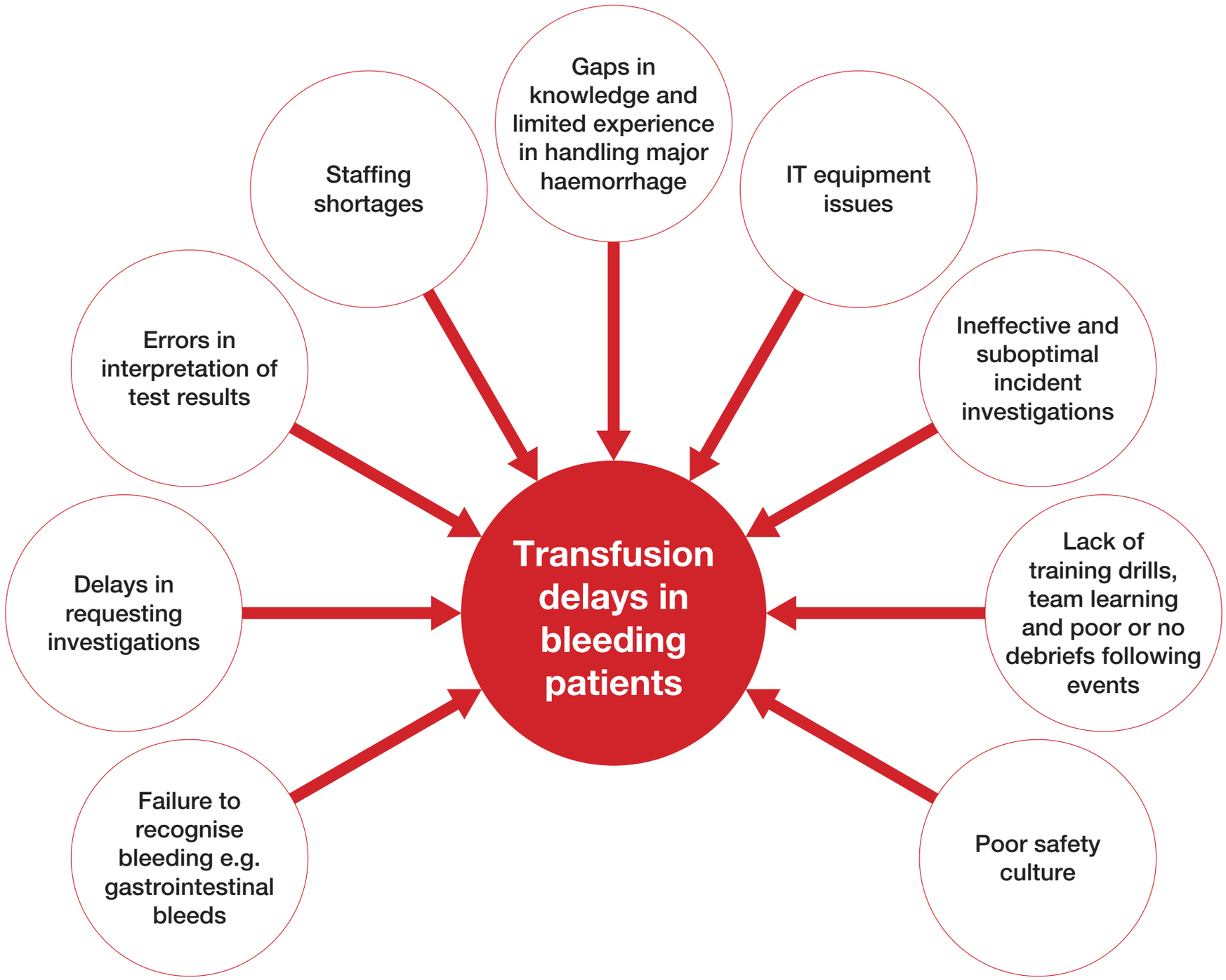


Figure 4.4: Framework for safe transfusions

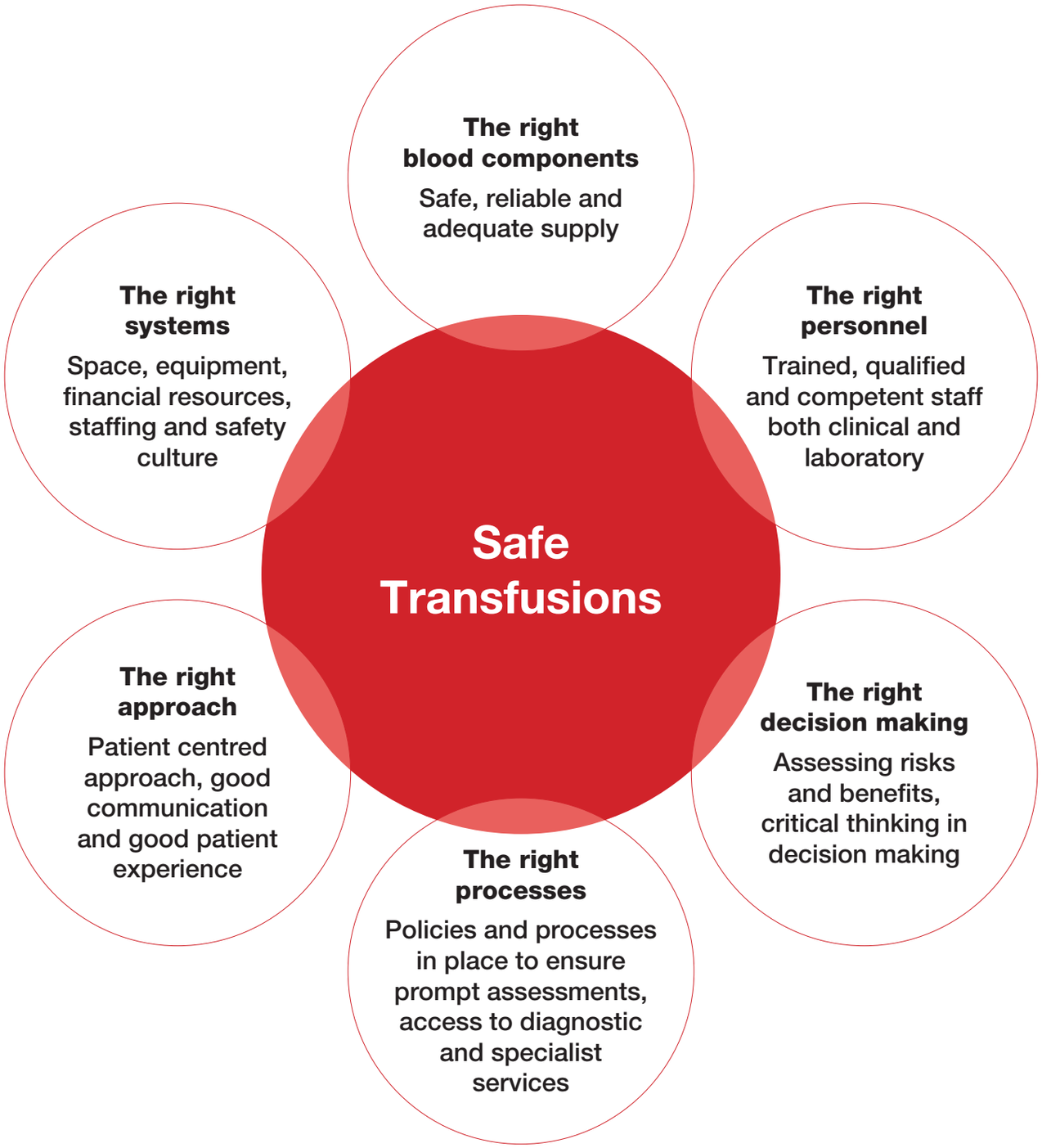


Figure 5.1 Trend in reports per 10,000 components issued in the UK

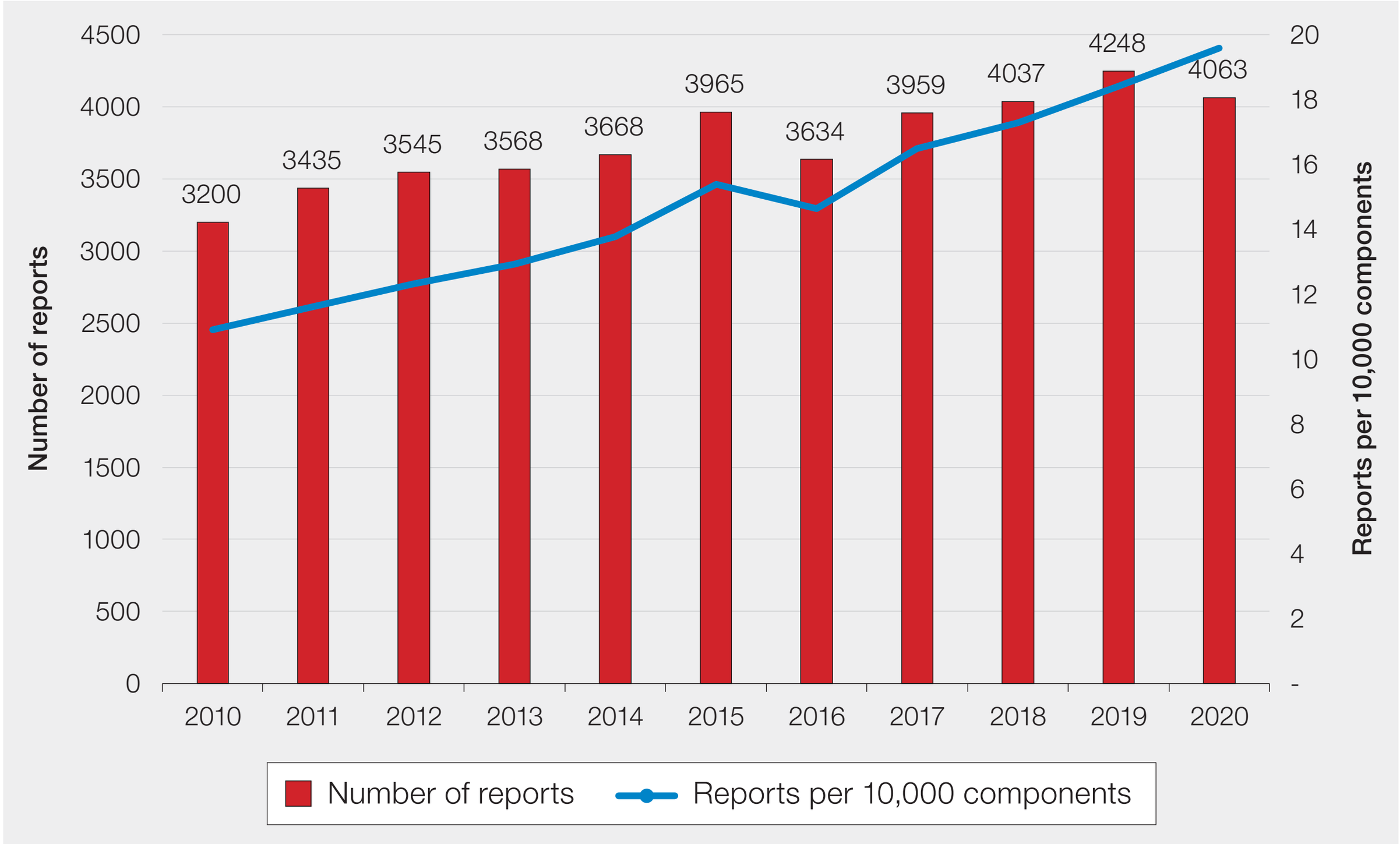
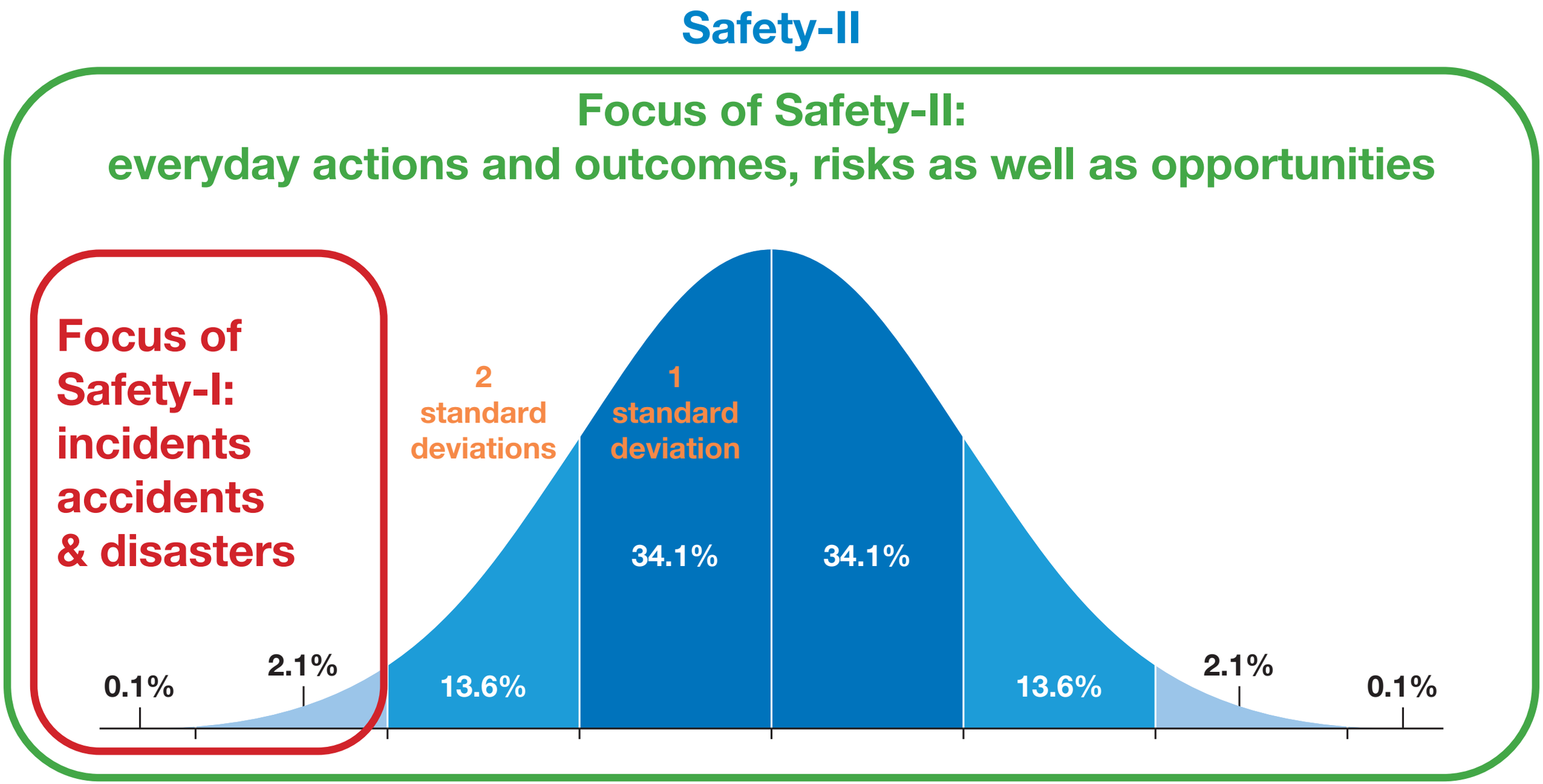


Figure 6.1: From Safety-I to Safety-II



Note: this figure is from James Christie's Blog, adapted from the Safety-I and Safety-II diagrams from the document 'From Safety-I to Safety-II: A White Paper (EUROCONTROL, 2013) and 'A White Paper on Resilience Engineering for ATM (EUROCONTROL, 2009)

Figure 6.2: The framework for measuring and monitoring safety – and useful prompts for using it in practice (from the Health Foundation, 2018)

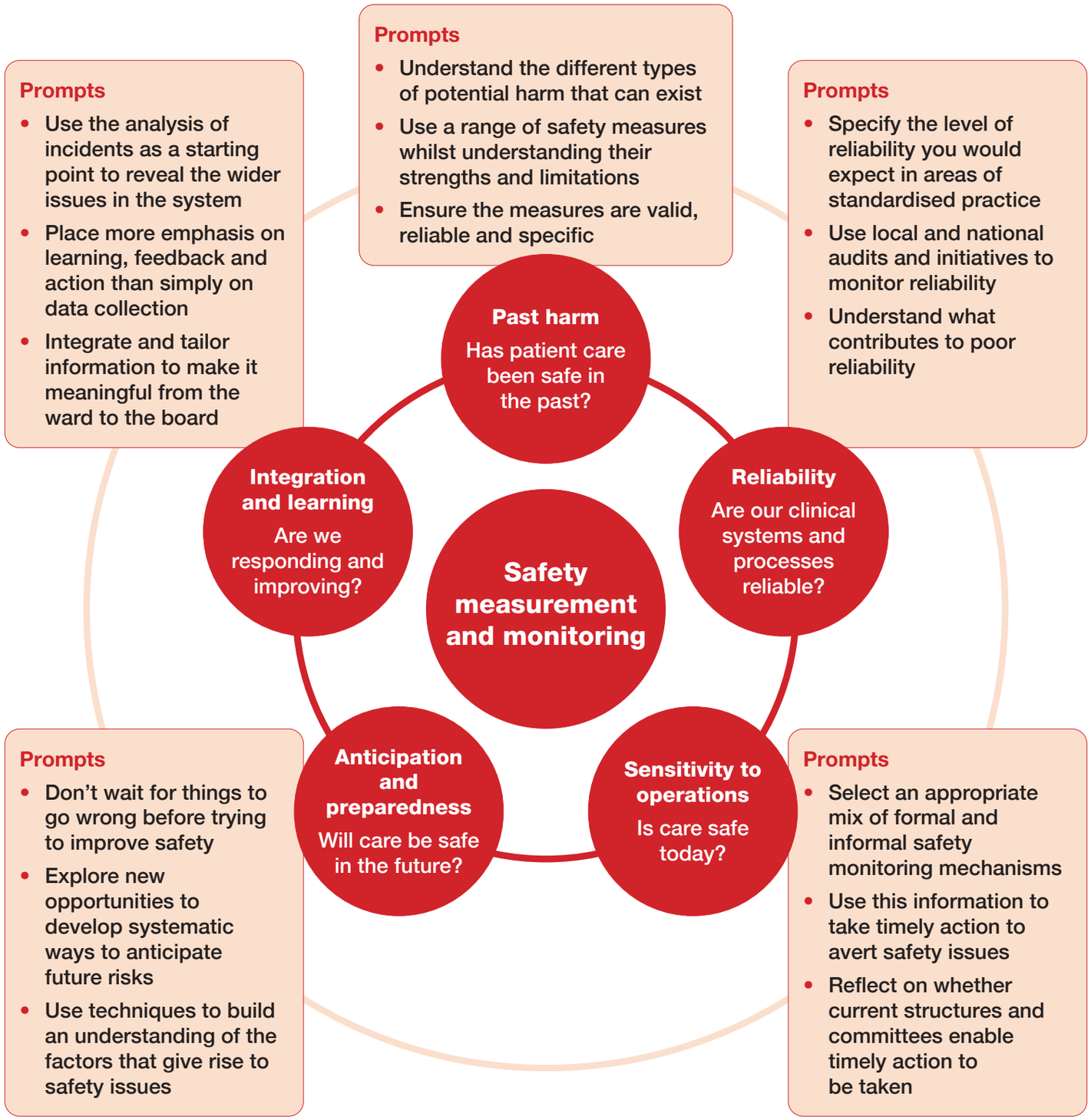


Figure 7.1: Rate of SAED reported per 10,000 donations in the UK from 2015-2020

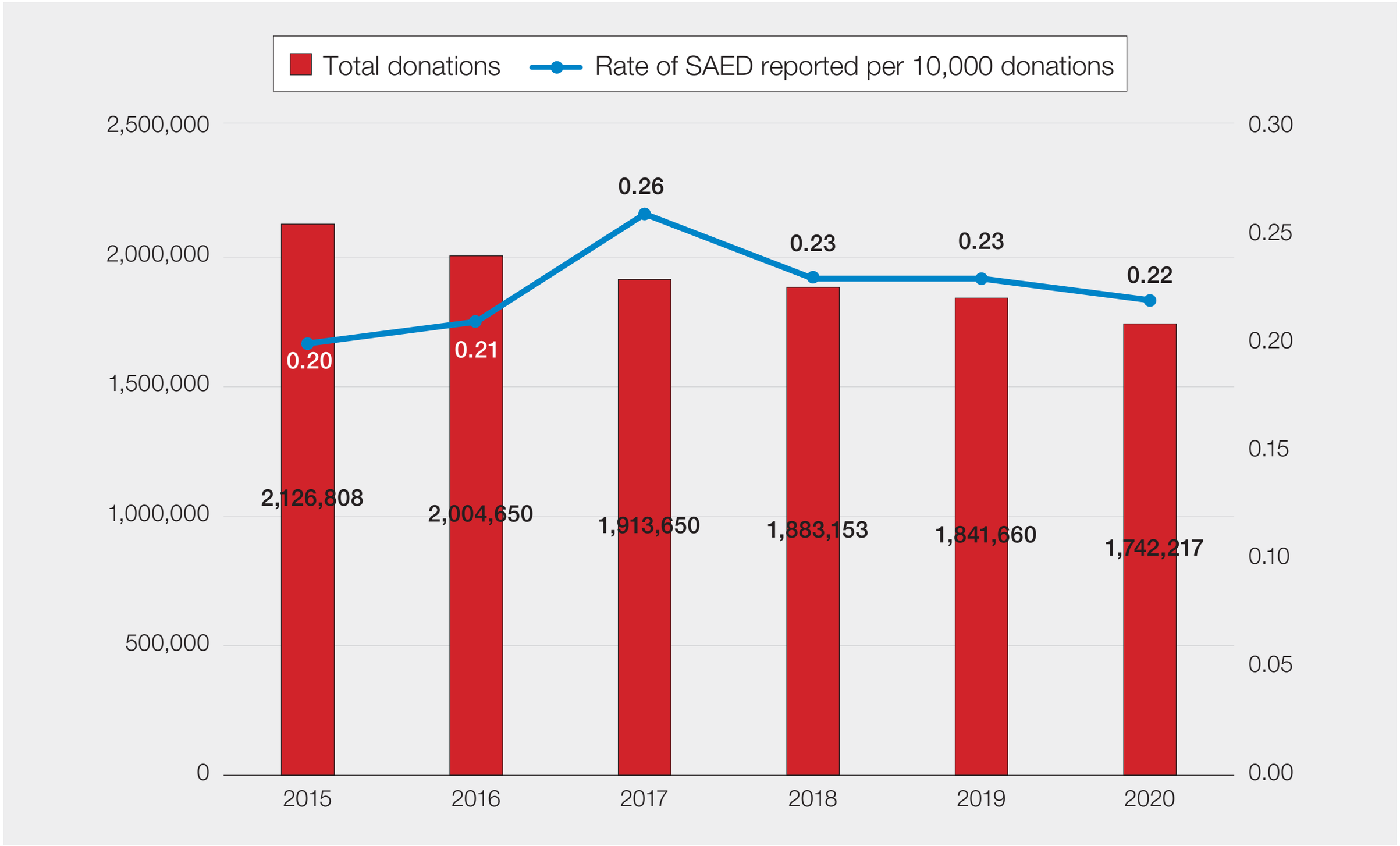


Figure 7.2: Serious Adverse Events following Blood Donation reported to the UK Blood Services in 2020

Figure 7.2: Summary of serious donor adverse events in the UK in 2020

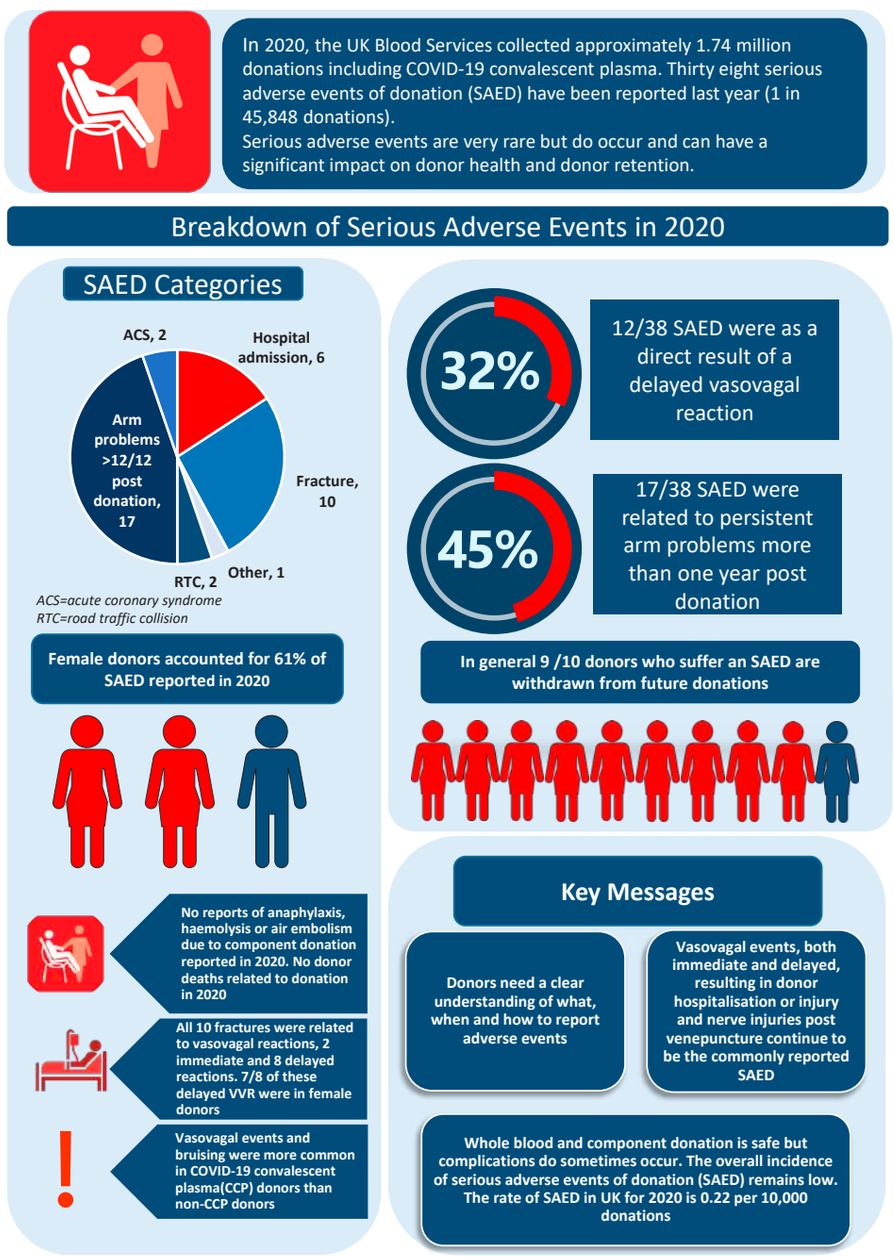


Figure 8.1: Evaluation of uptake of self-learning opportunity and comparative percentages of scores for human and organisational factors

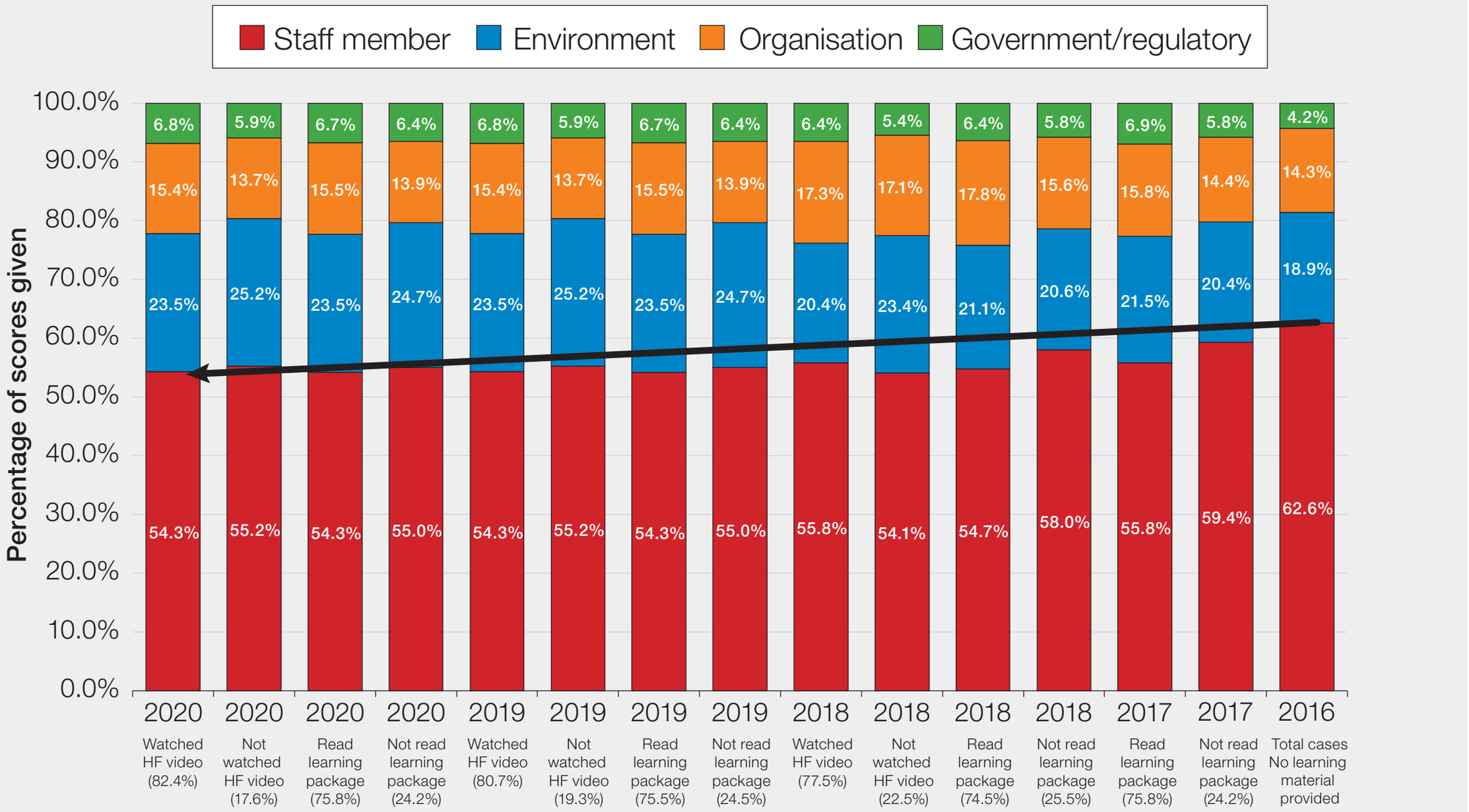


Figure 8.2: Assessment of whether multiple contributory factors were assigned HF scores (2020)

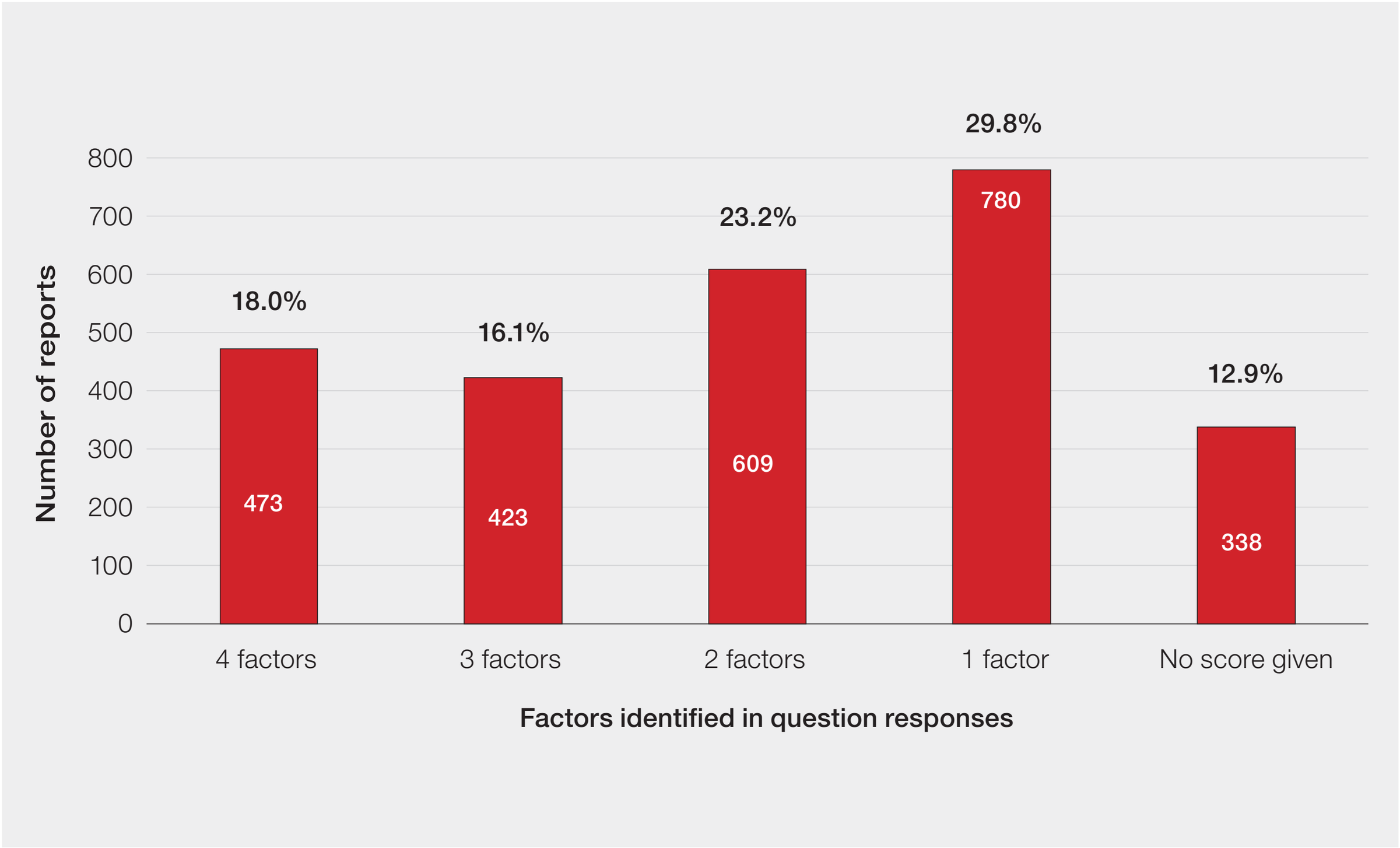


Figure 8.3: Comparison of percentages when the incident was scored for all four of the human and system factors or for fewer than four factors (2020)

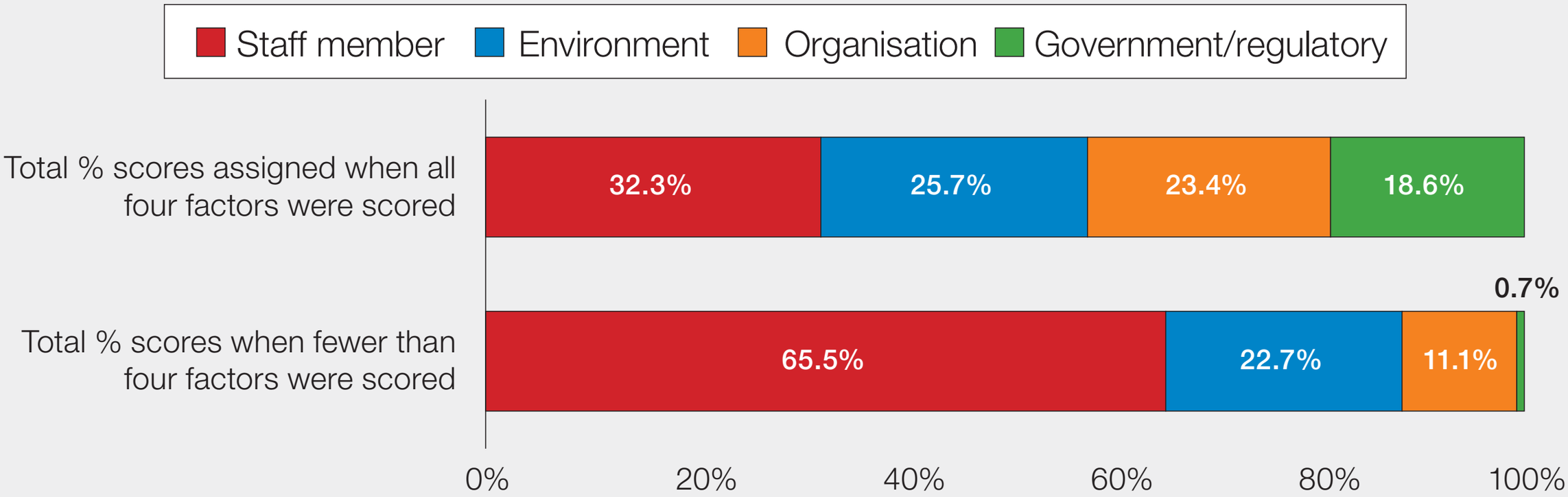


Figure 8.4: Factors identified for one change likely to reduce recurrence of the incident (n=970 responses) (2020)

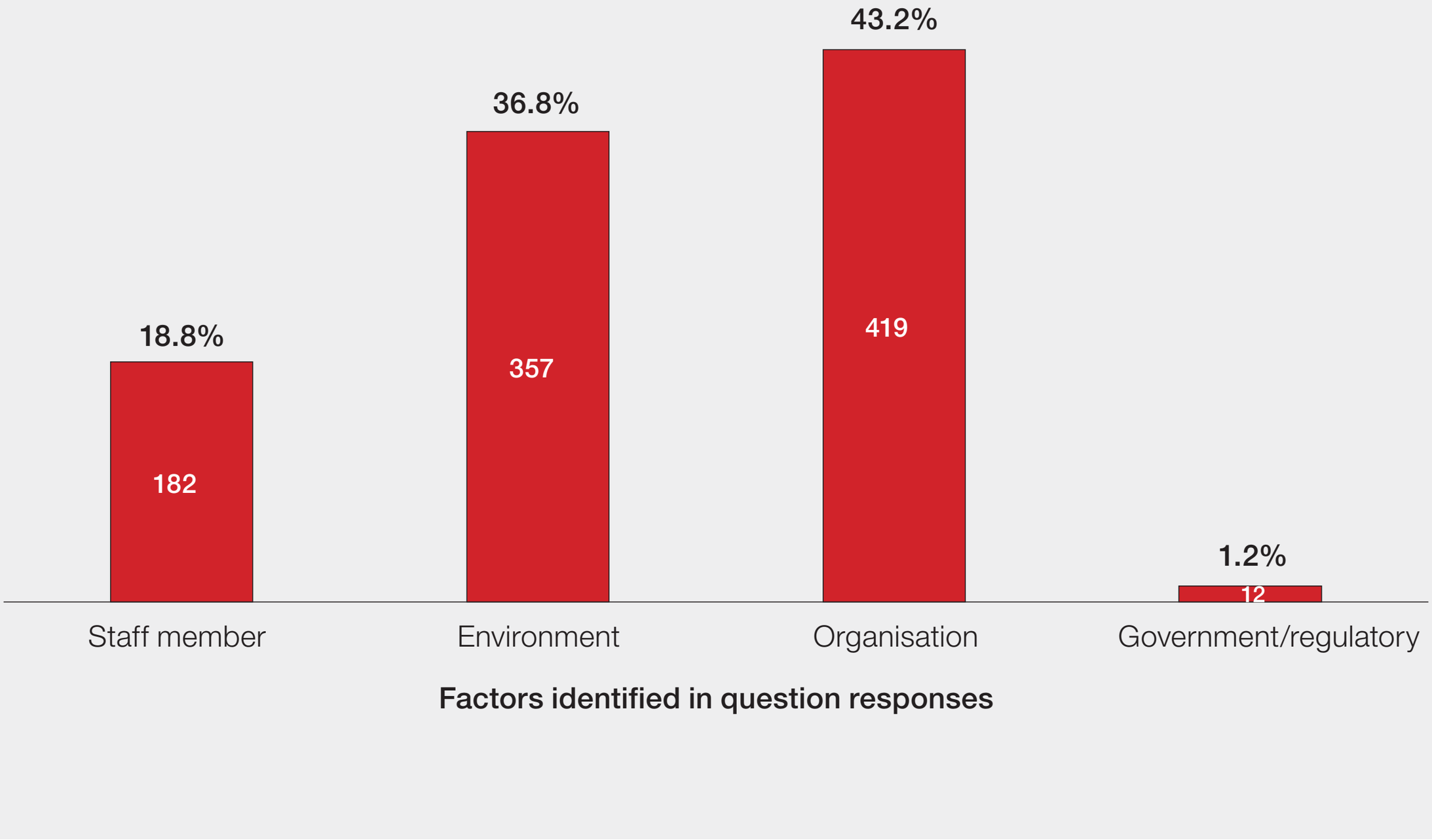


Figure 8.5: Percentages of the types of factors identified where a change was suggested (n=970) compared to percentages of HFIT scores in the same cases (2020)

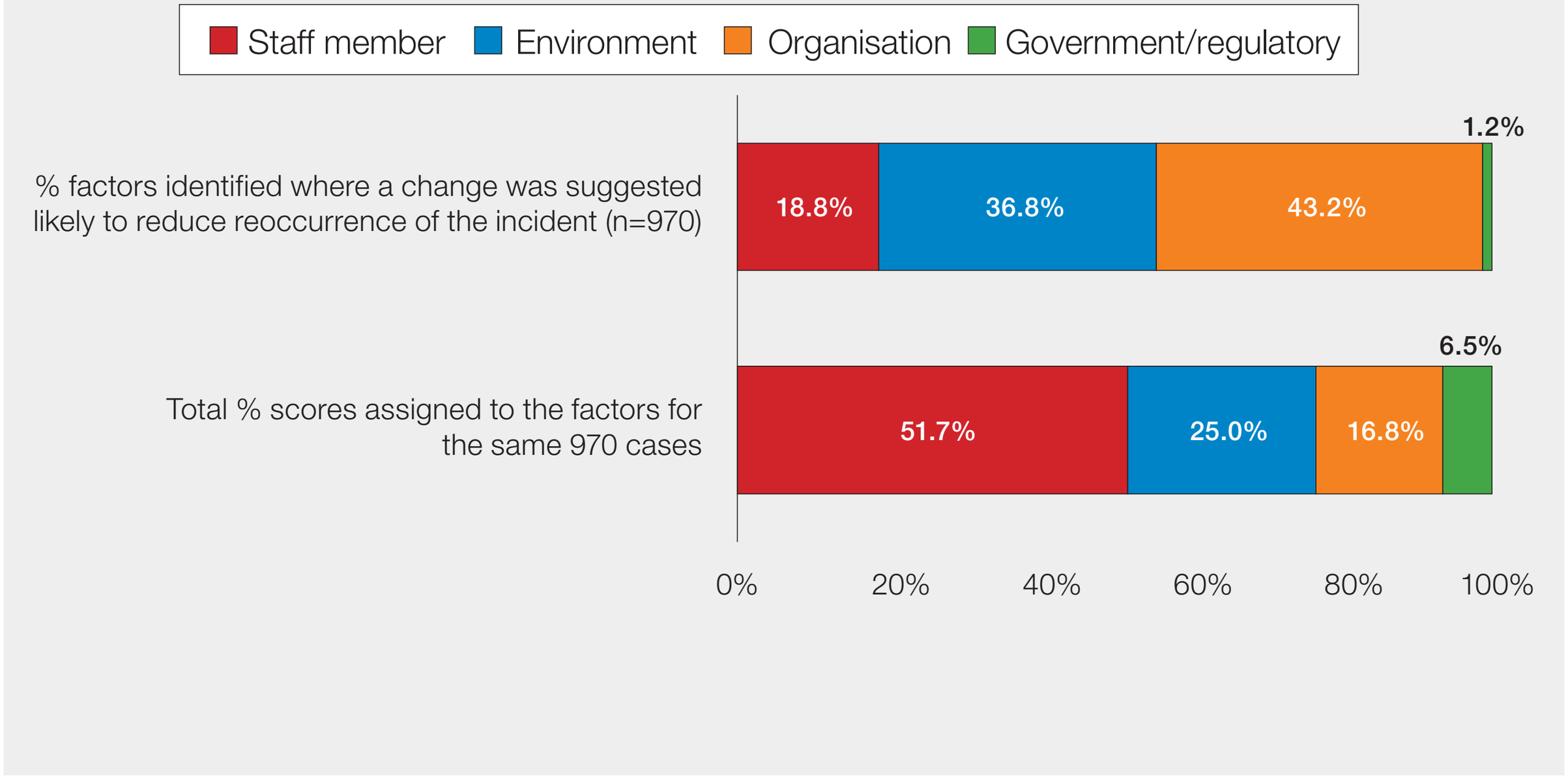


Figure 9.1: Distribution of anti-D Ig related error reports in 2020 (n=400)

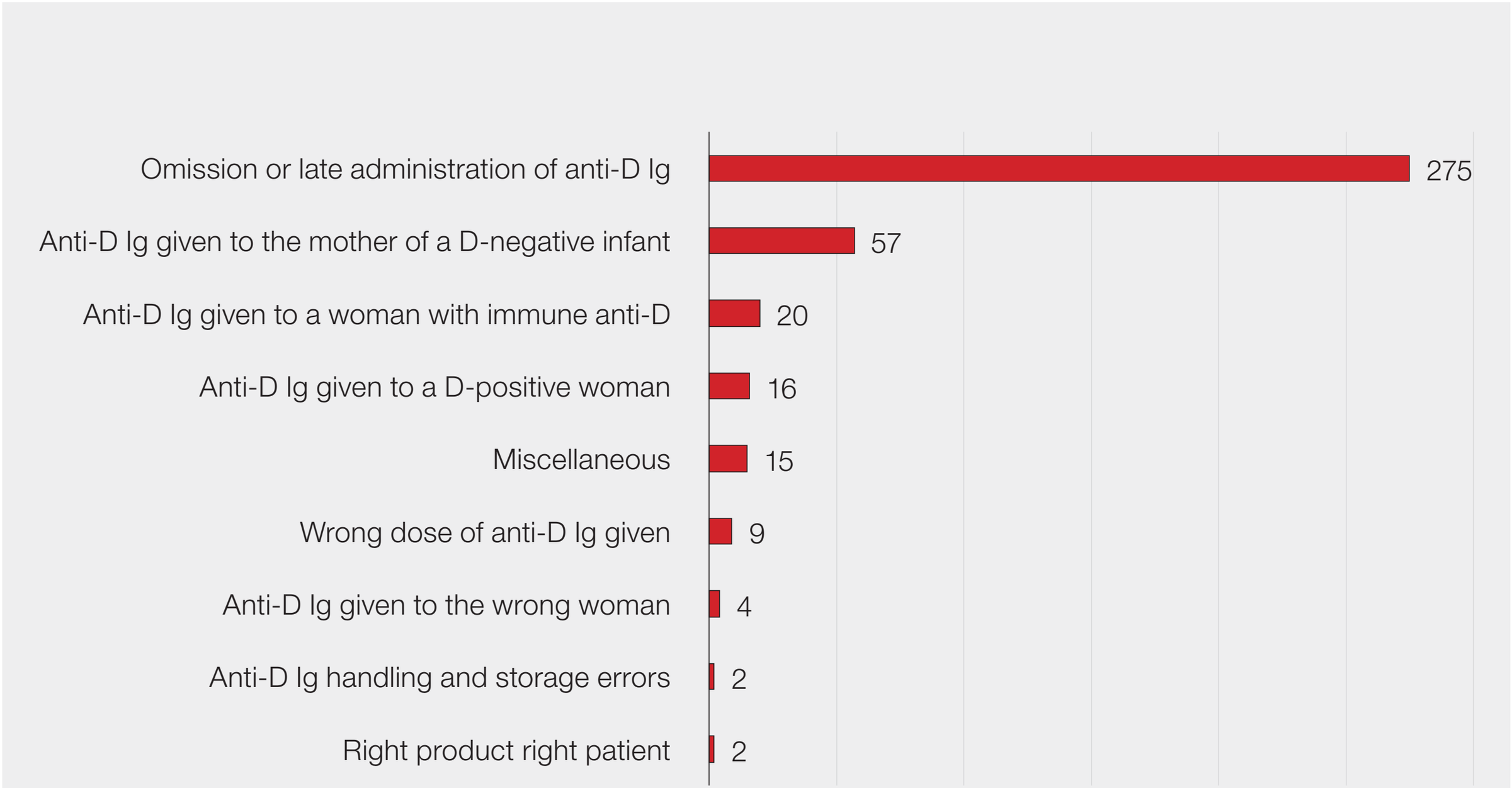


Figure 9.2: Errors relating to cffDNA in 2020 (n=47)

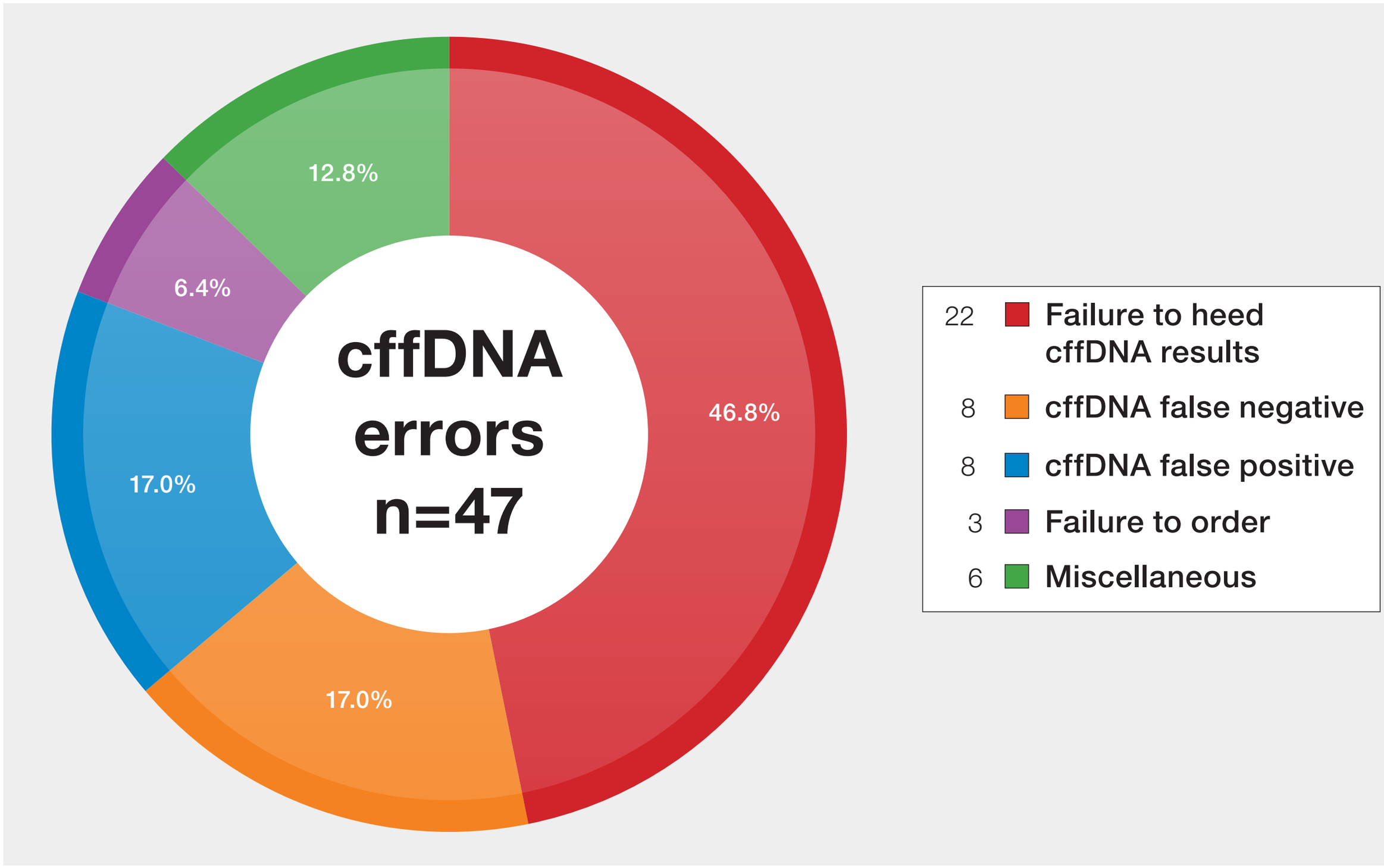
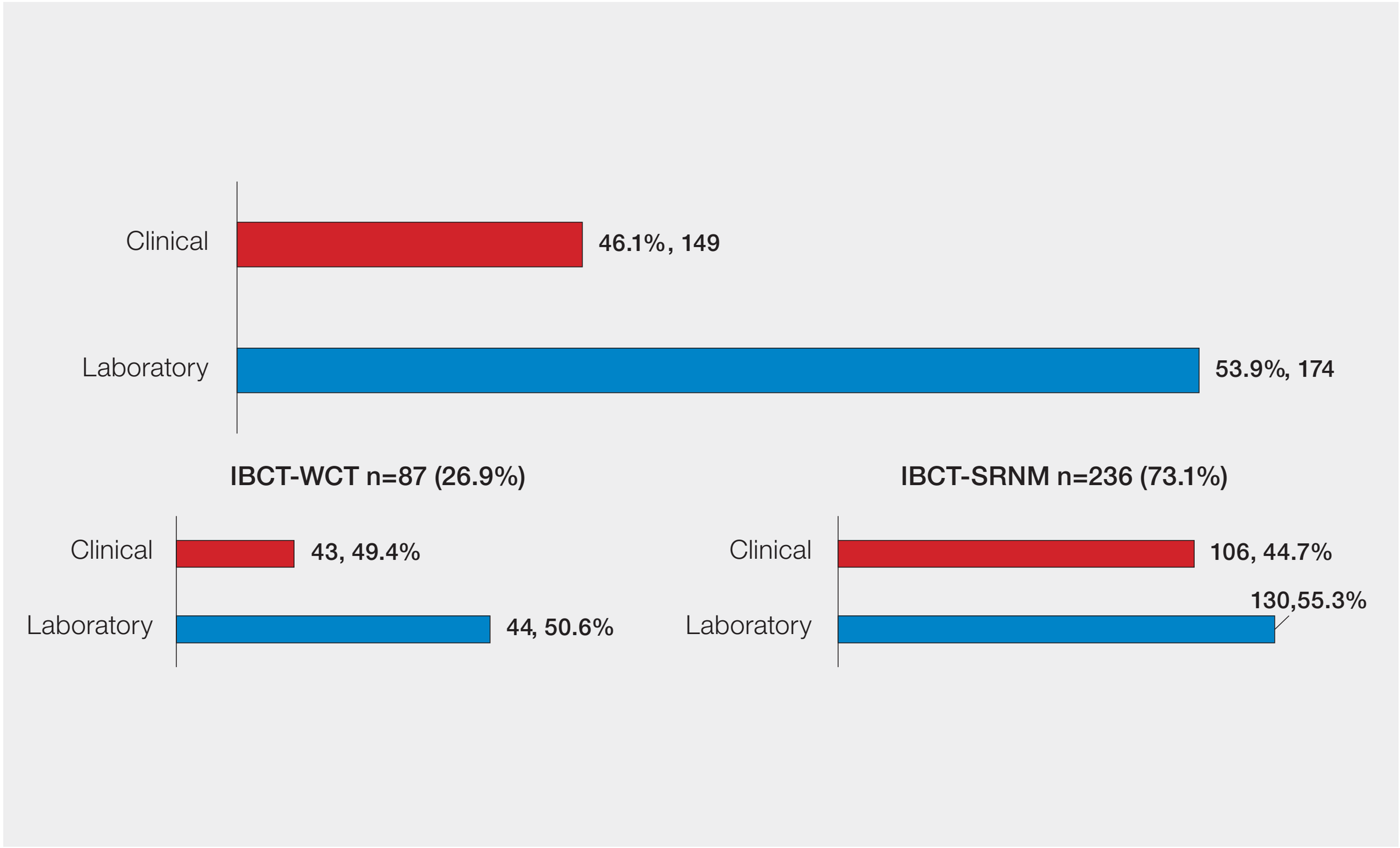
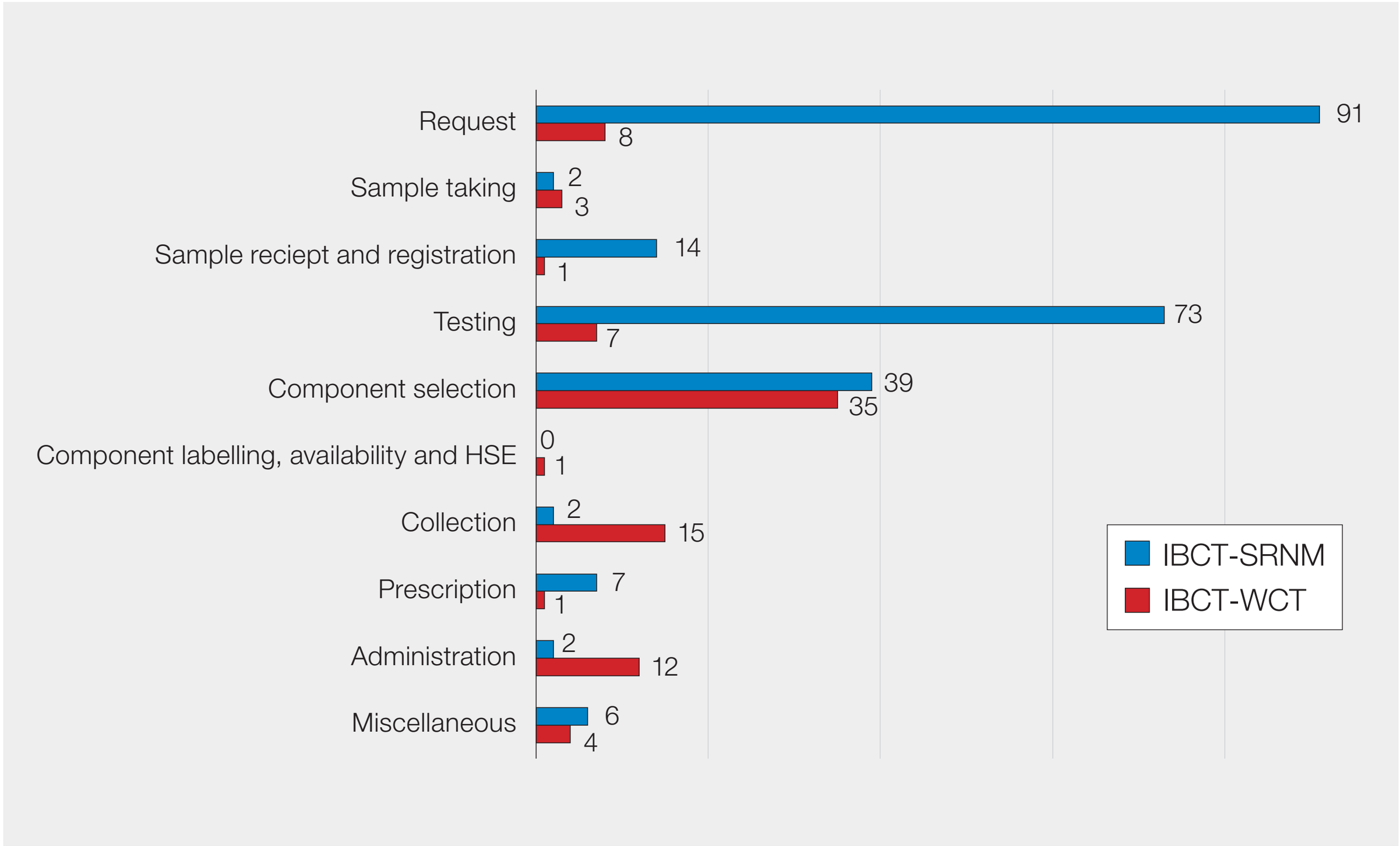


Figure 10.1: Overview of reports where an incorrect blood component was transfused in 2020 (n=323)



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

Figure 10.2: Total incorrect blood component transfused errors categorised by the step where the error occurred (n=323)



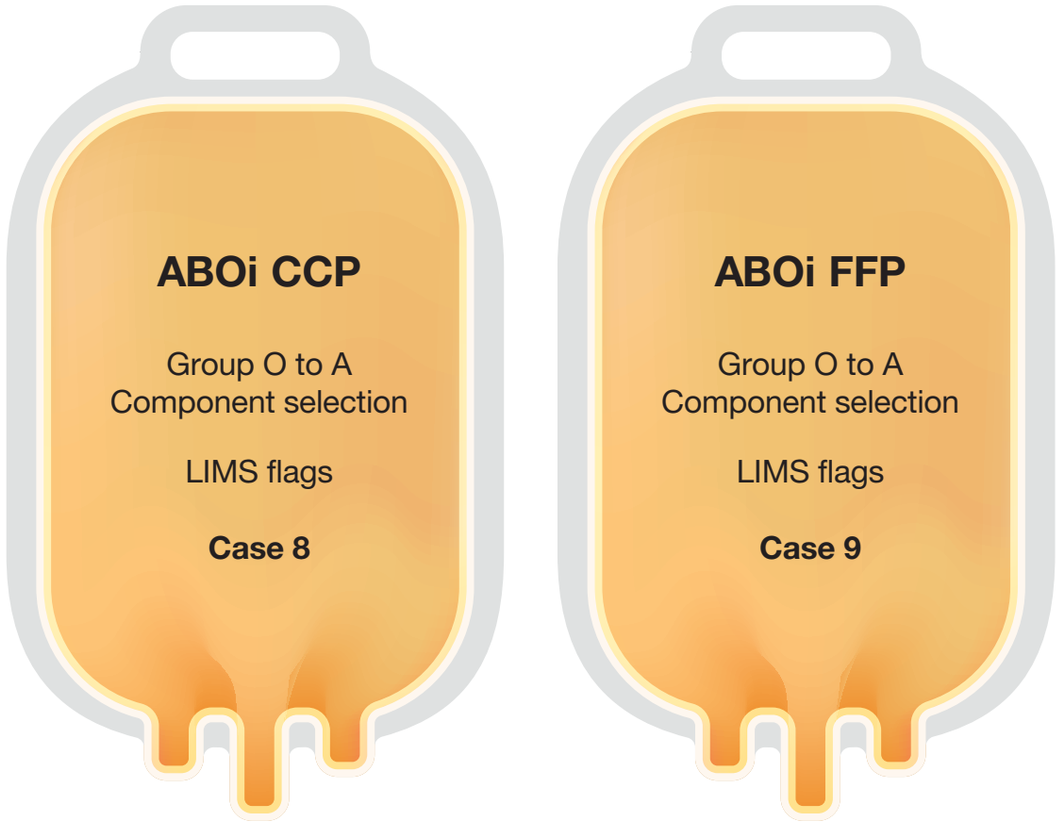
IBCT-WCT=incorrect blood component transfused-wrong component transfused; IBCT-SRNM=IBCT-specific requirements not met; HSE=handling and storage errors

Figure 10.3: Clinical ABOi red cell cases (n=7)

ABOi=ABO-incompatible

Note: case numbers refer to the cases in Table 10.1

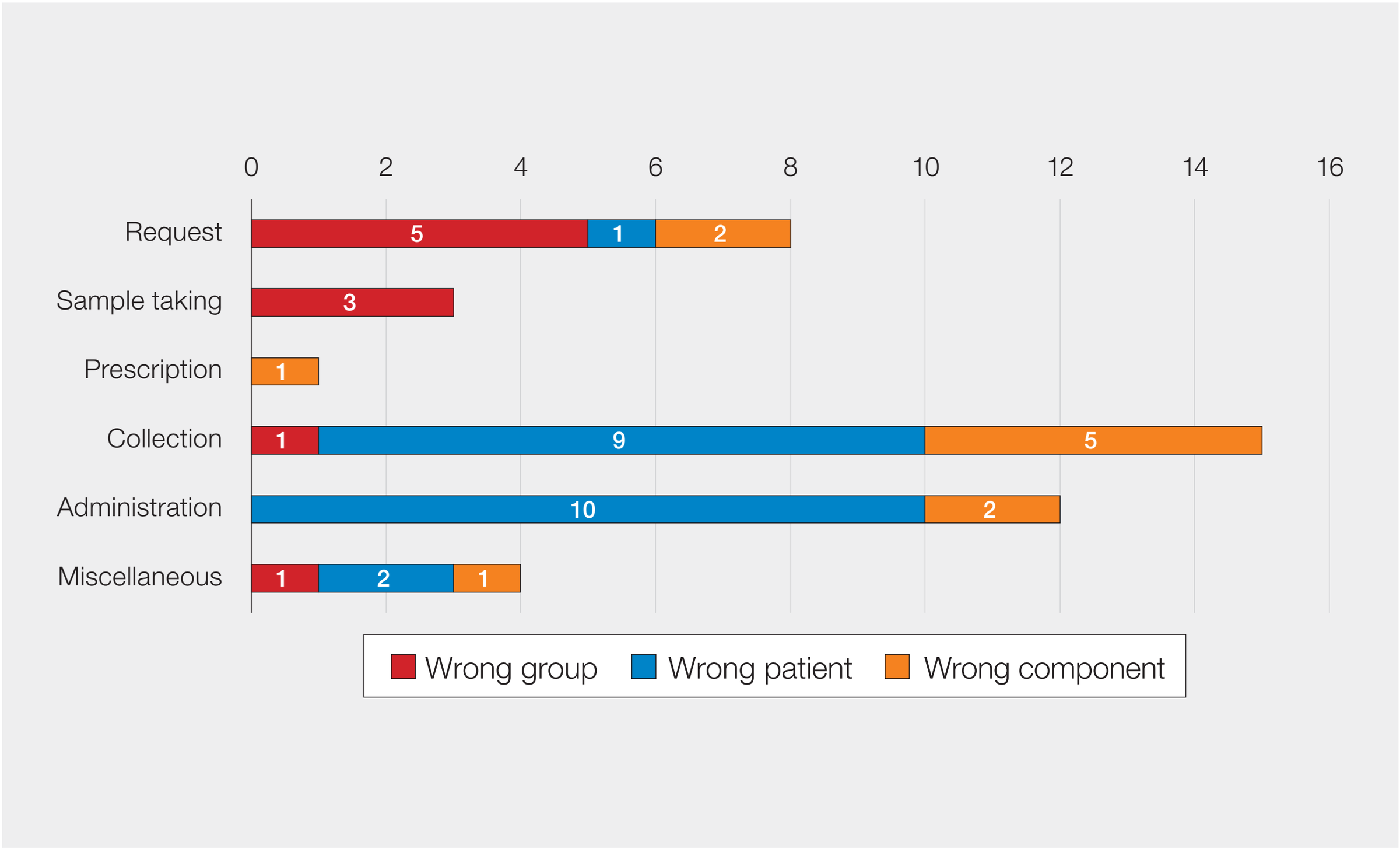
Figure 10.4: Laboratory ABOi cases (n=2)



ABOi=ABO-incompatible; CCP=COVID-19 convalescent plasma; FFP=fresh frozen plasma; LIMS=laboratory information management system

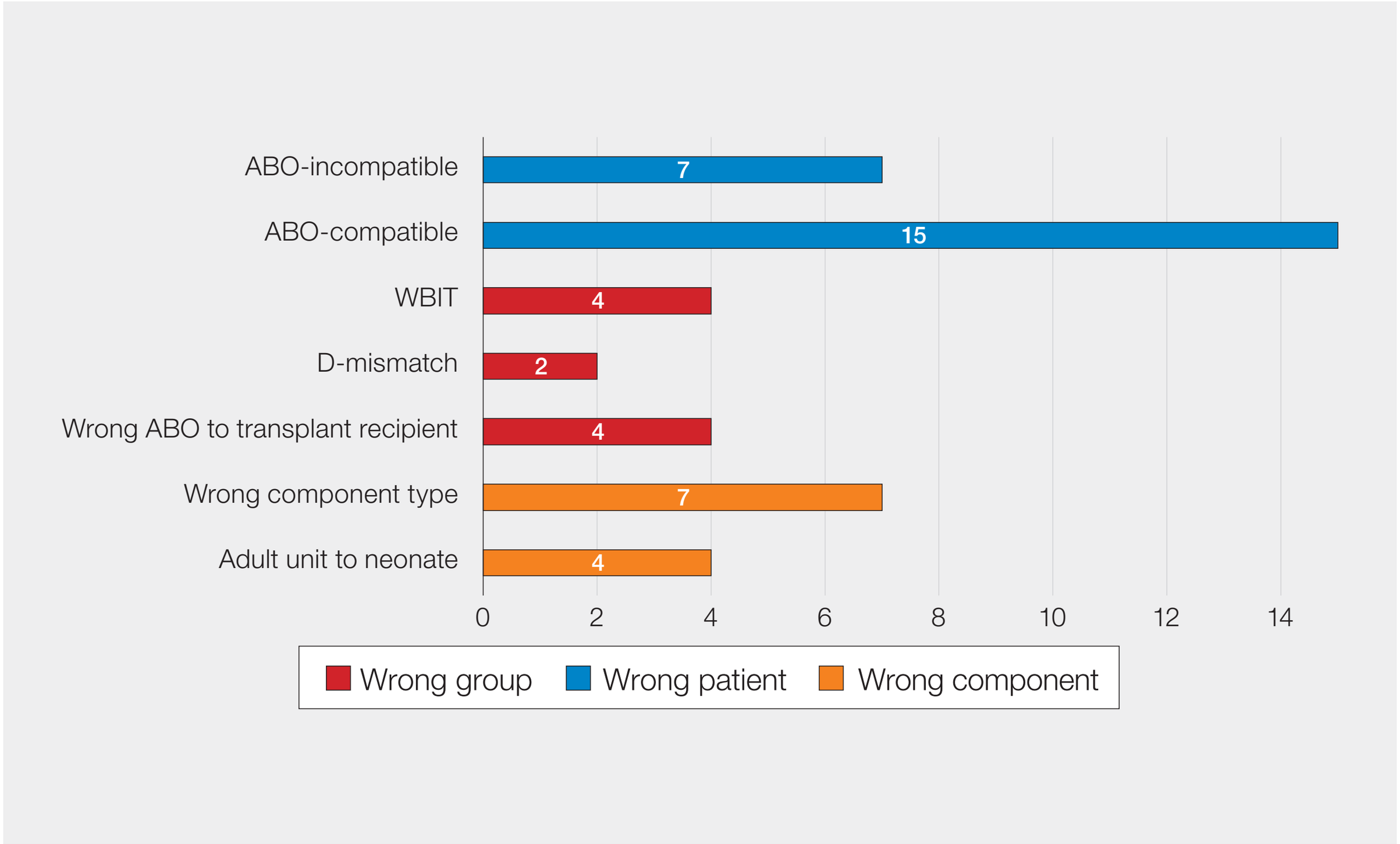
Note: case numbers refer to the cases in Table 10.1

Figure 10.5a: Categorisation of clinical WCT errors by transfusion step where the primary error occurred (n=43)



Note: 'Miscellaneous' cases include: a WBIT where the patient was clerked with another patient's details, an adult unit administered to a neonate where this was a conscious decision made by the doctor due to volume requirements, a patient who was wearing another patient's ID band, and patient details on a compatibility label manually changed by clinical staff

Figure 10.5b: Categorisation of clinical WCT errors by sub-category (n=43)



Note: Wrong blood in tube (WBIT) events which resulted in ABO/D compatible blood transfusions

Figure 10.6: Clinical errors resulting in IBCT-SRNM categorised by patient impact and stage the error occurred (n=106)

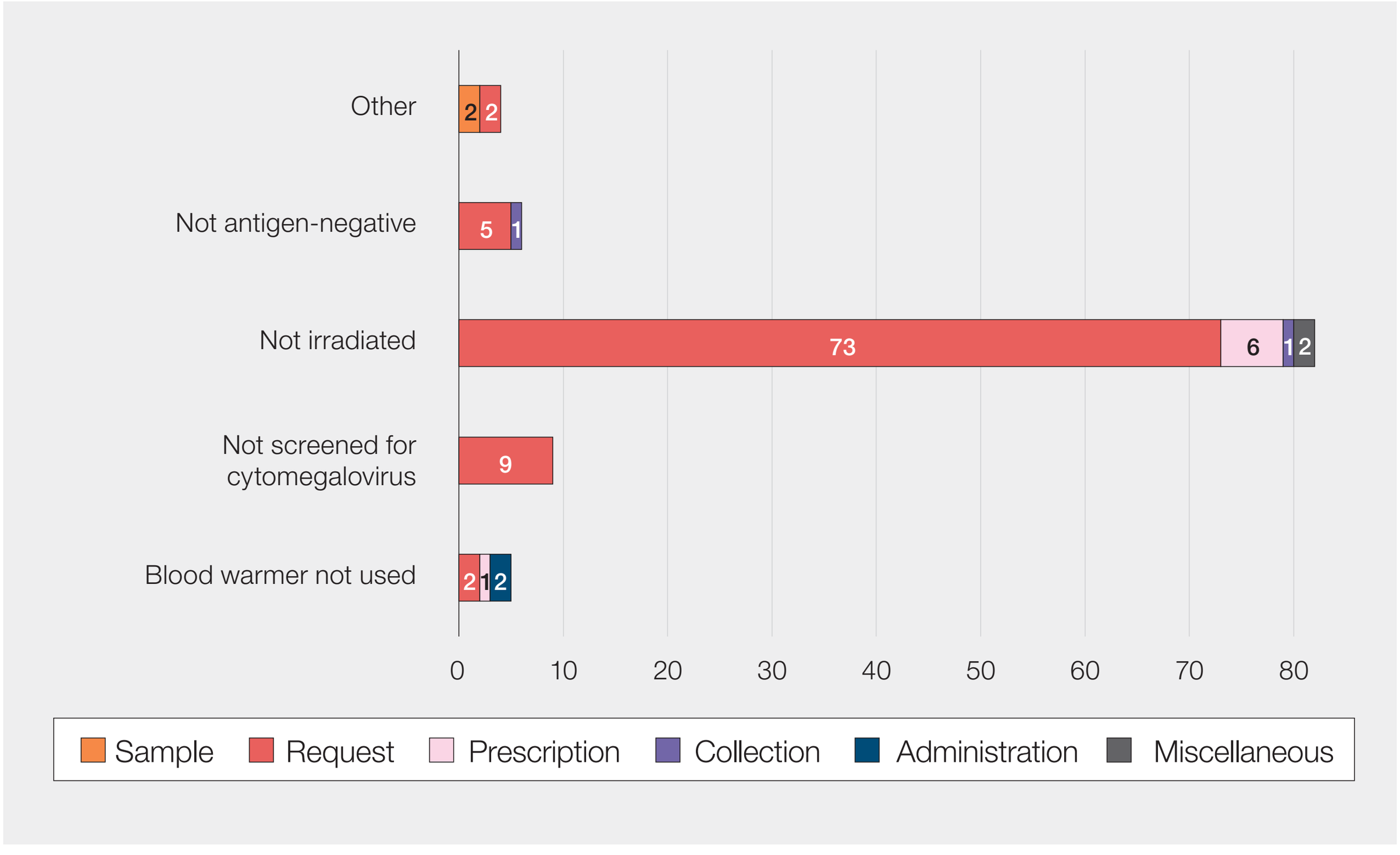


Figure 10.7a: Laboratory WCT errors by transfusion step where the primary error occurred (n=44)

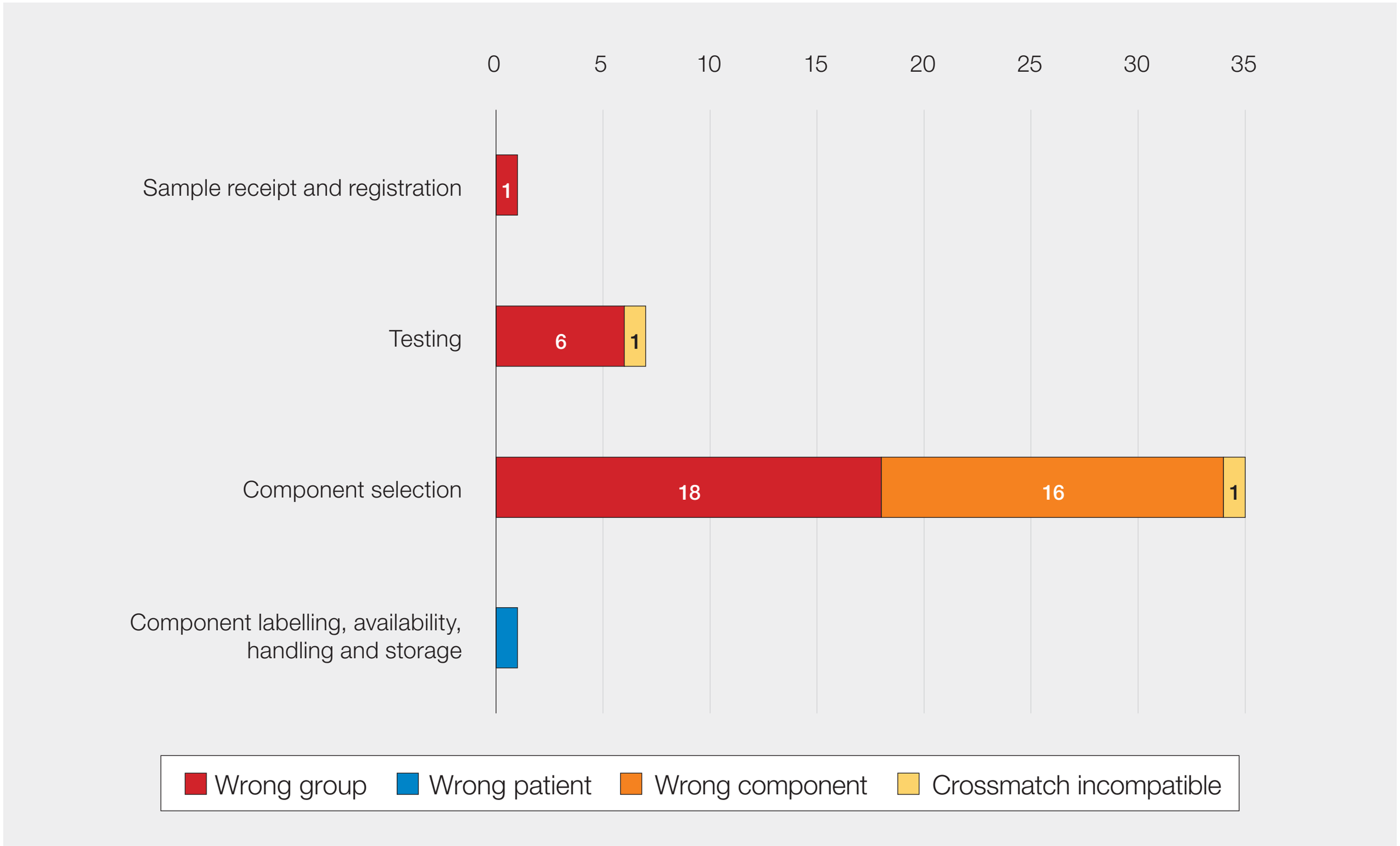
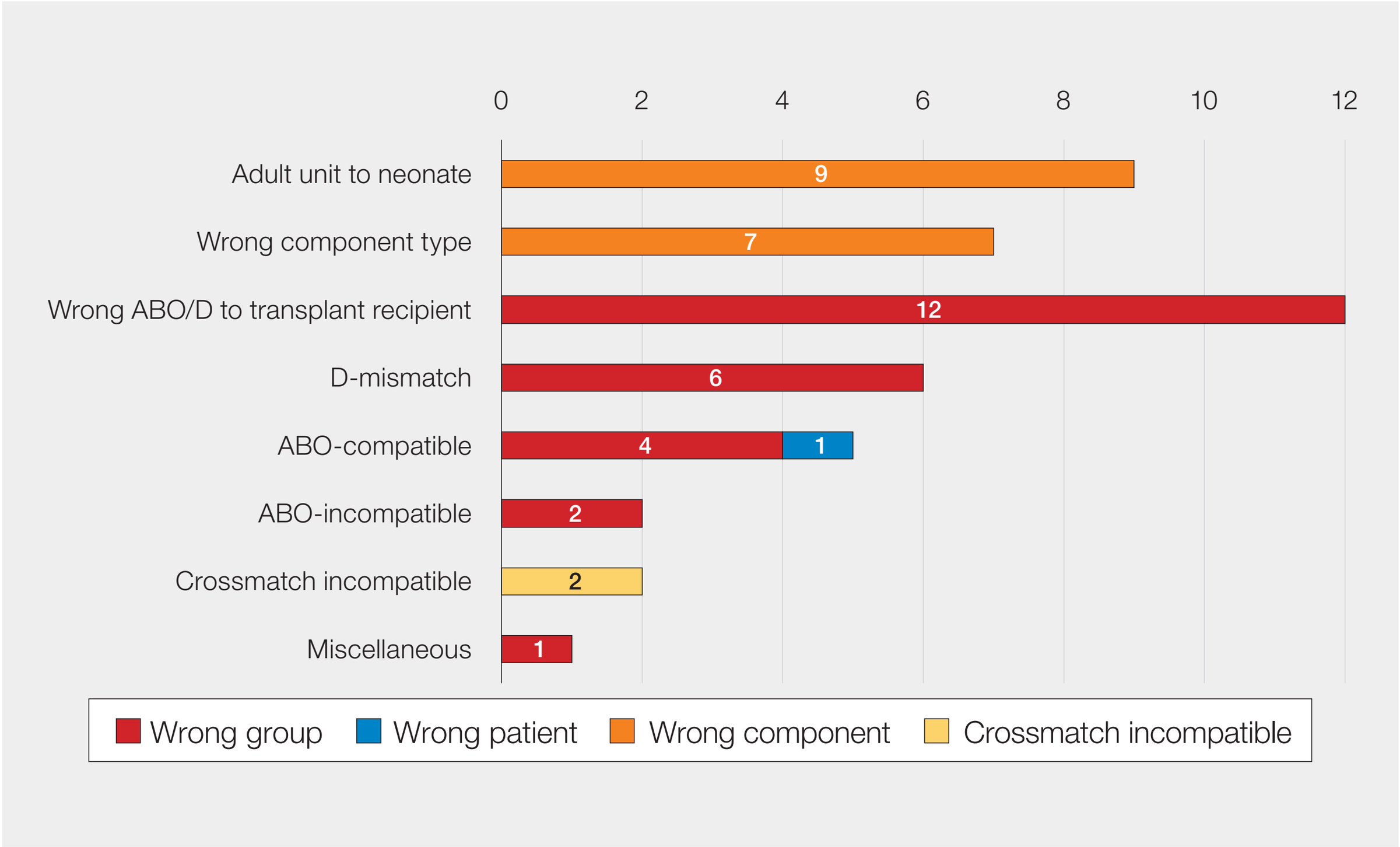
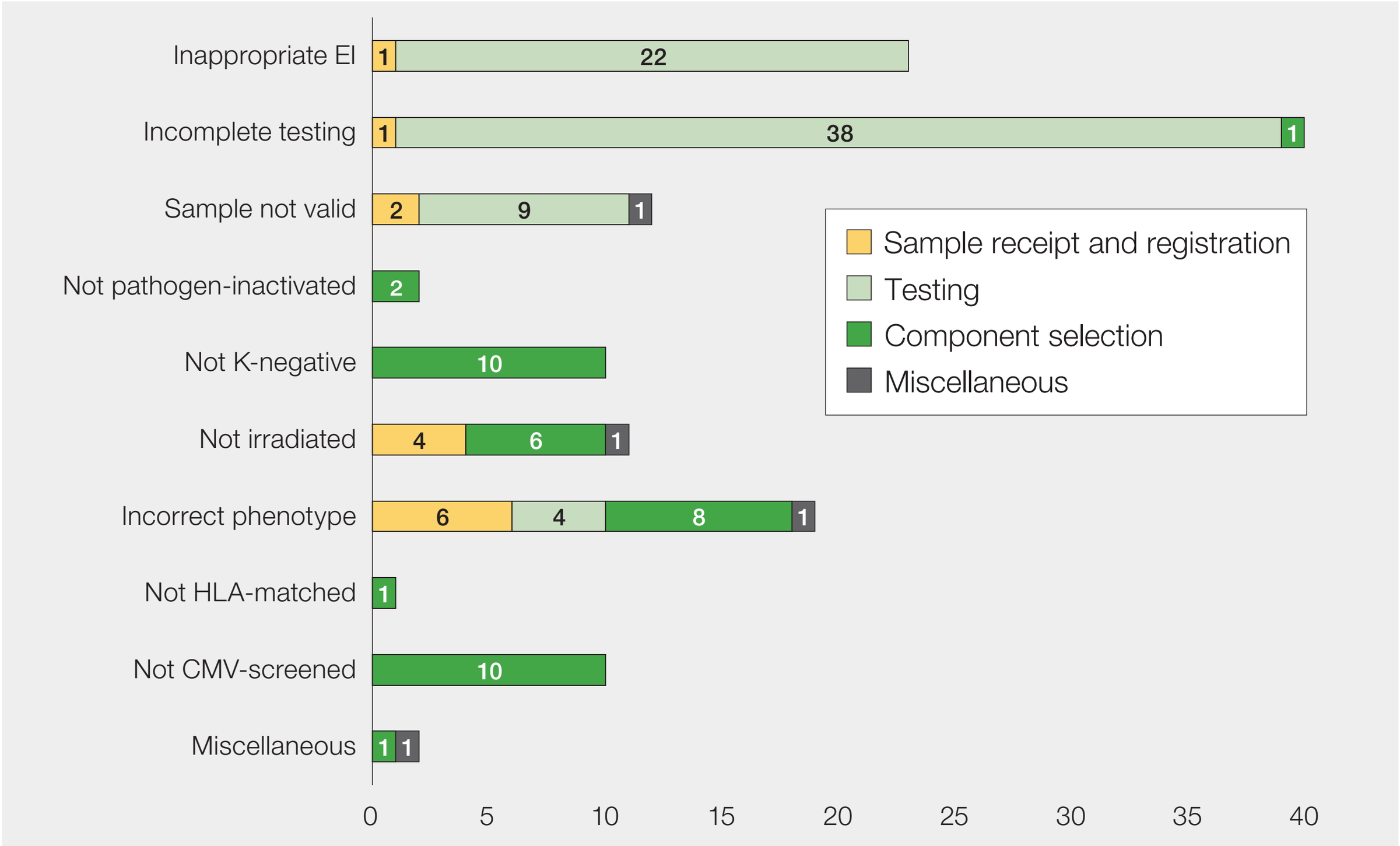


Figure 10.7b: Laboratory WCT errors by category (n=44)



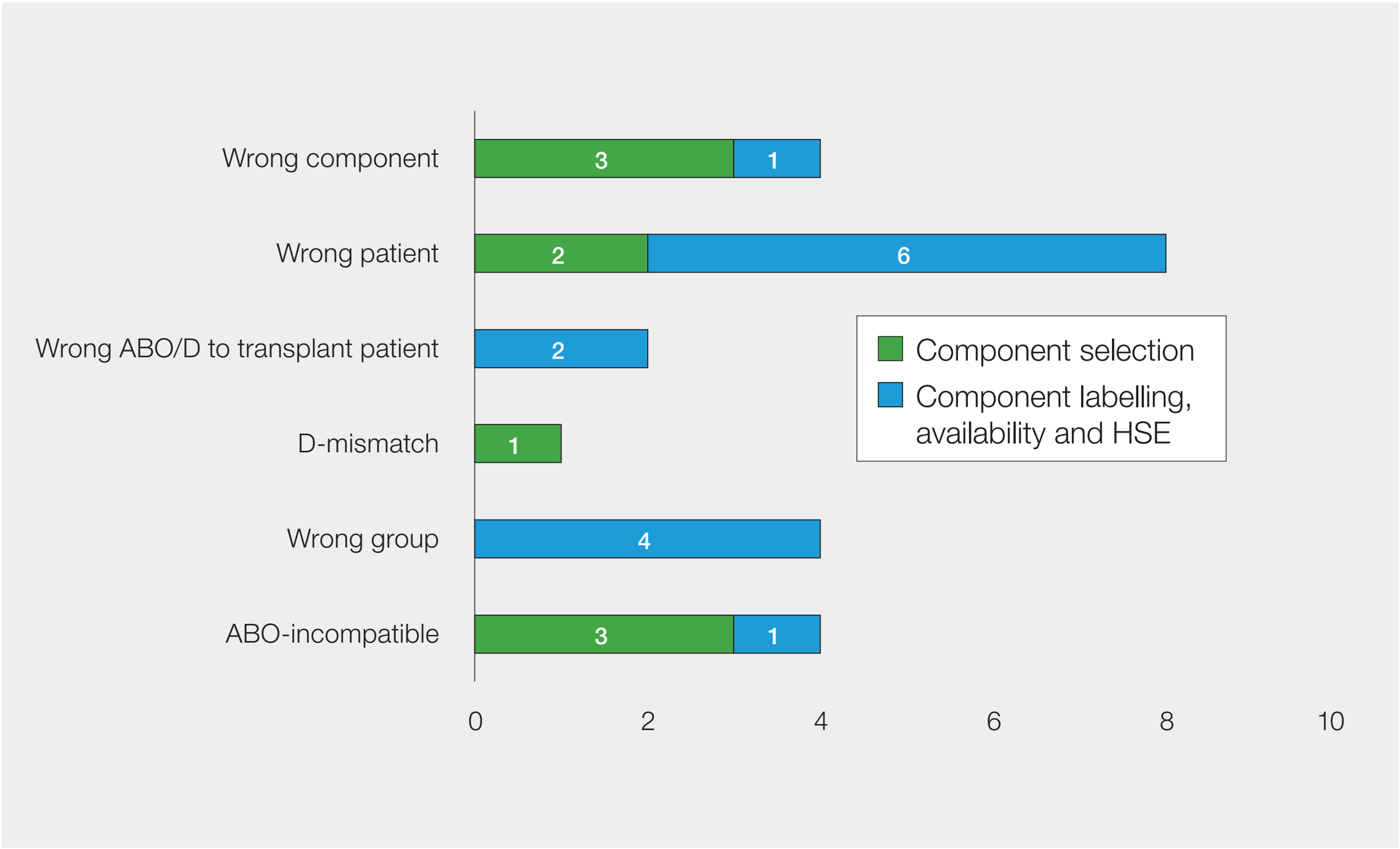
Note: Case classified as 'Miscellaneous' involved communication errors between the issuing laboratory and the laboratory who routinely treated this patient.

Figure 10.8: Laboratory errors resulting in IBCT-SRNM (n=130)



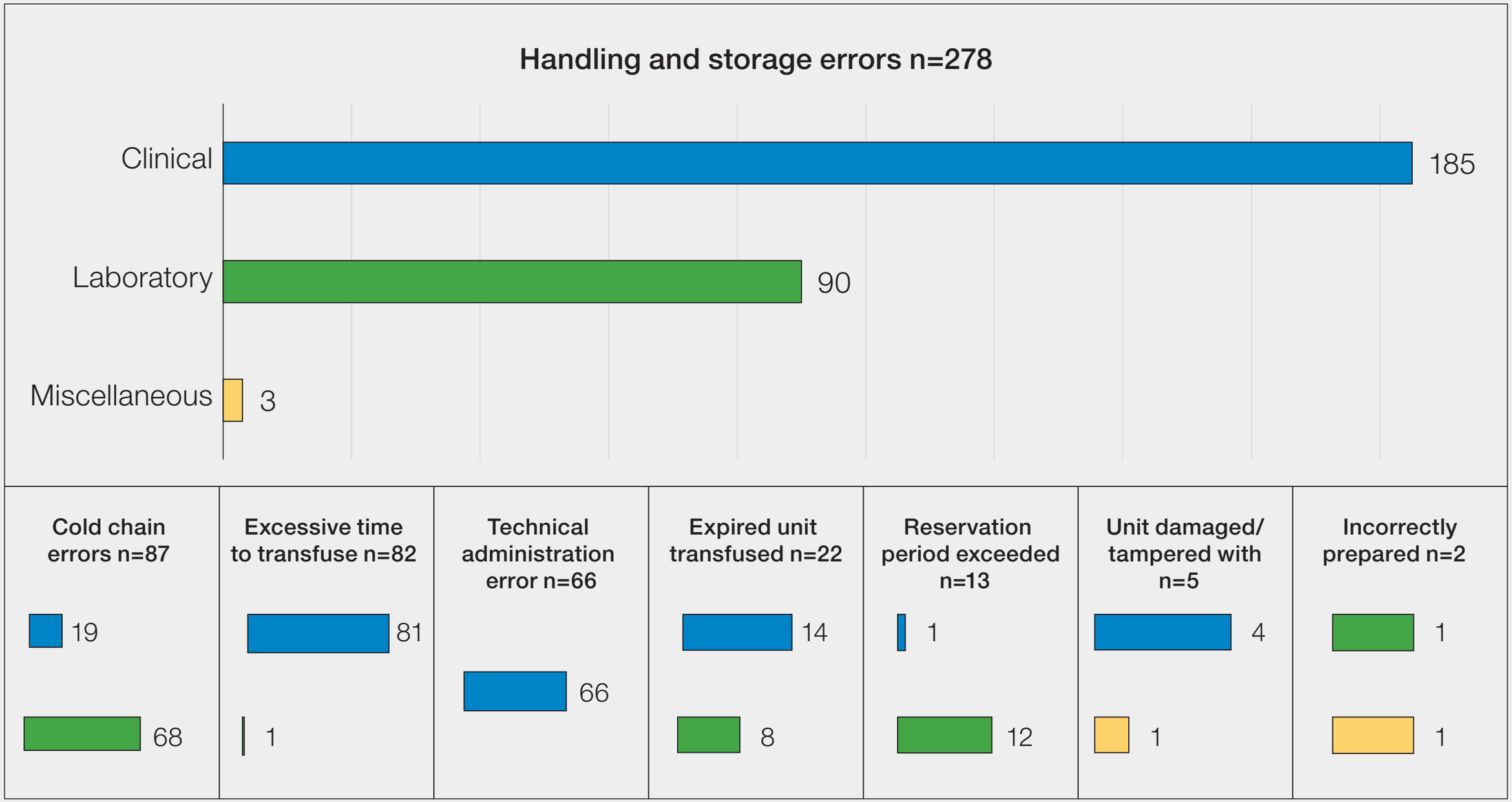
CMV=cytomegalovirus; HLA=human leucocyte antigen

Figure 10.9: Laboratory near miss IBCT-WCT events categorised by error and step in the transfusion process (n=23)



HSE = handling and storage errors

Figure 11.1: Breakdown of 2020 handling and storage error reports (n=278)



The top graph shows an overview of the HSE errors. These are broken down into specific groups of errors in the bottom graph. One case categorised as 'miscellaneous' is not displayed by error in the bottom graphs as it did not fit into any of the categories.

Figure 12a.1: Delayed transfusion reports and deaths by year 2011 to 2020 (n=773, deaths n=52)

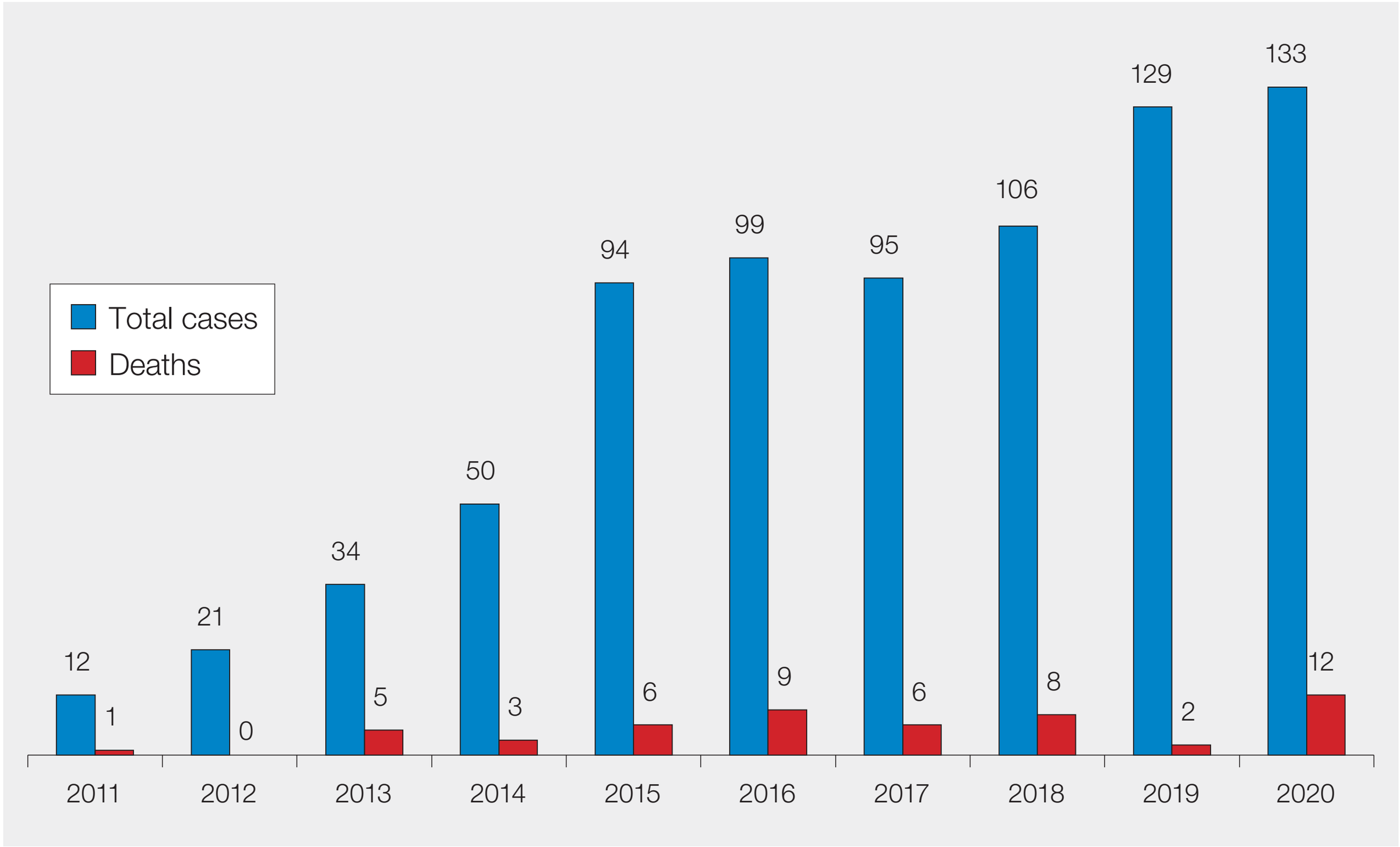


Figure 12a.2: Errors contributing to delayed transfusion

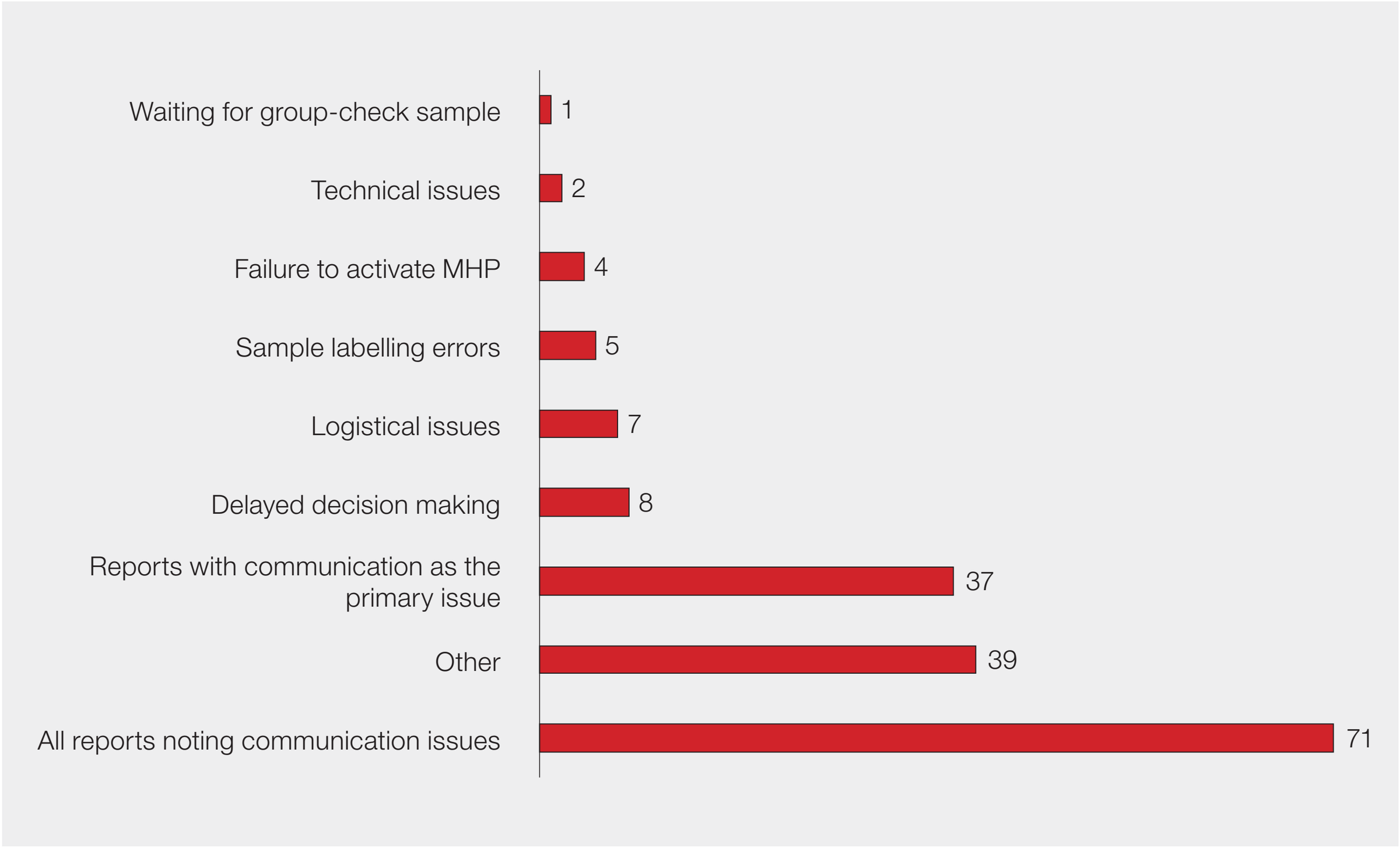
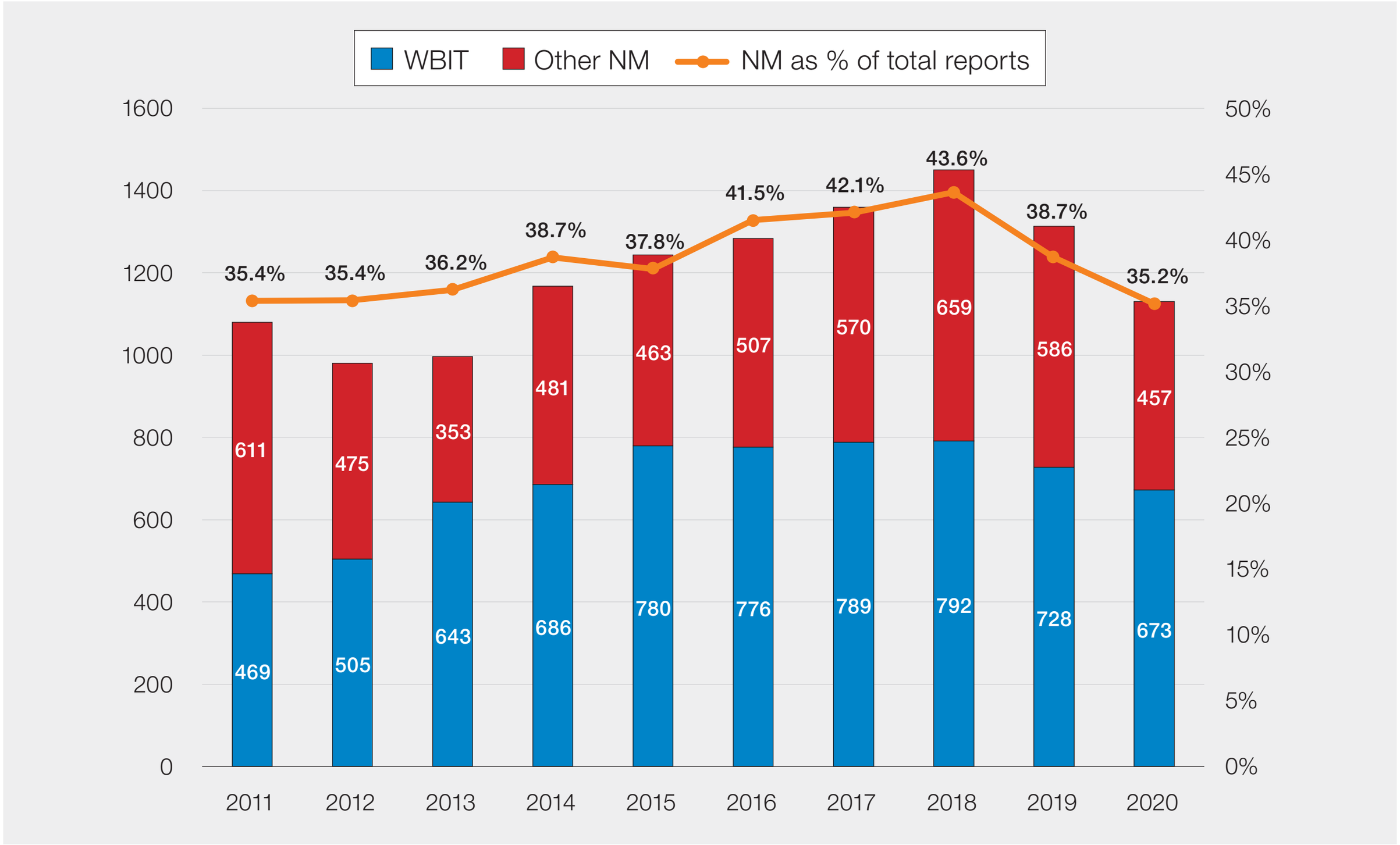


Figure 13.1: A decade of near miss and WBIT reports 2011-2020



WBIT= wrong blood in tube; NM= near miss

Figure 13a.1: Primary errors leading to WBIT (n=673)

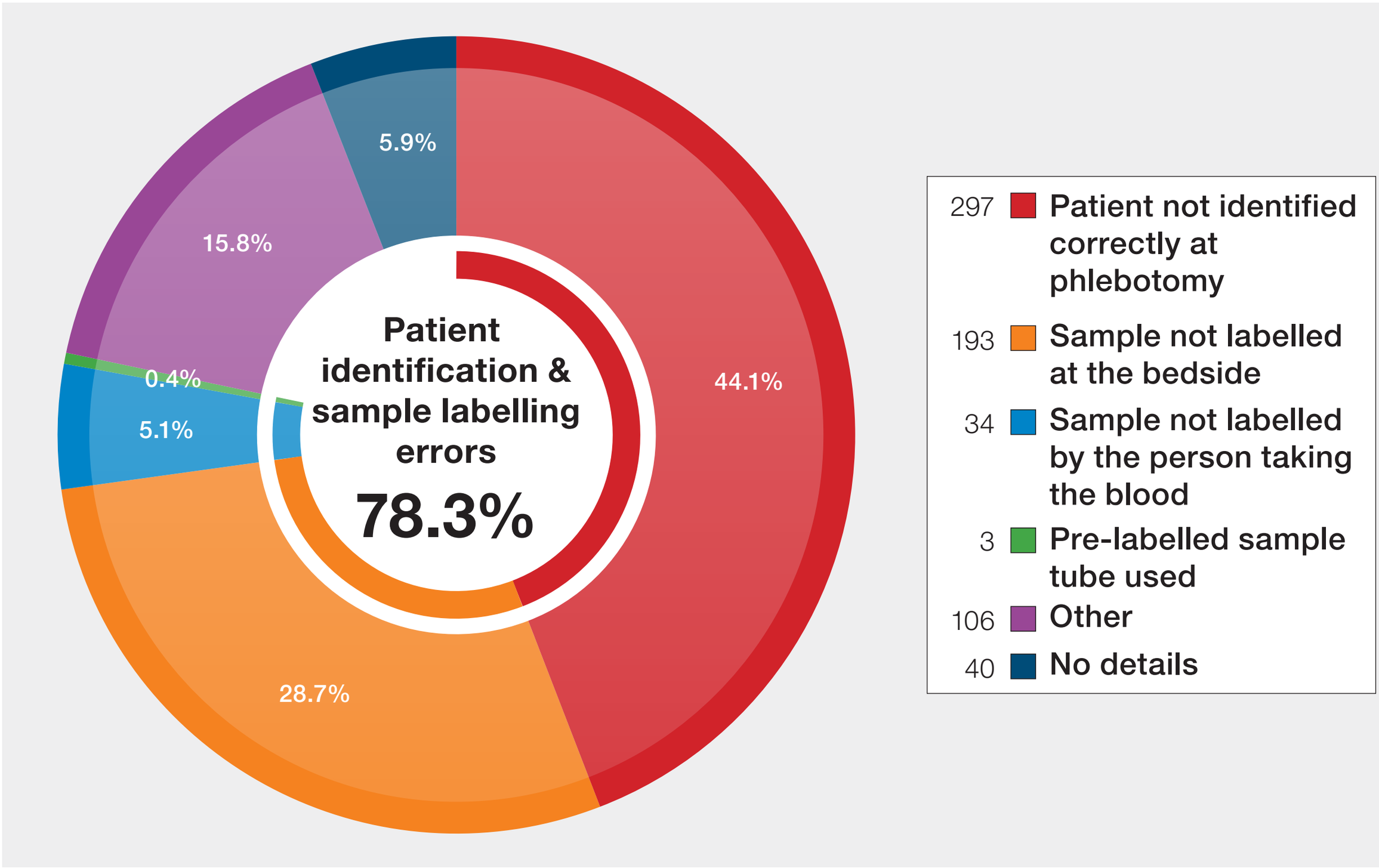


Figure 13a.2: Point in the process where the error was detected (n=673)

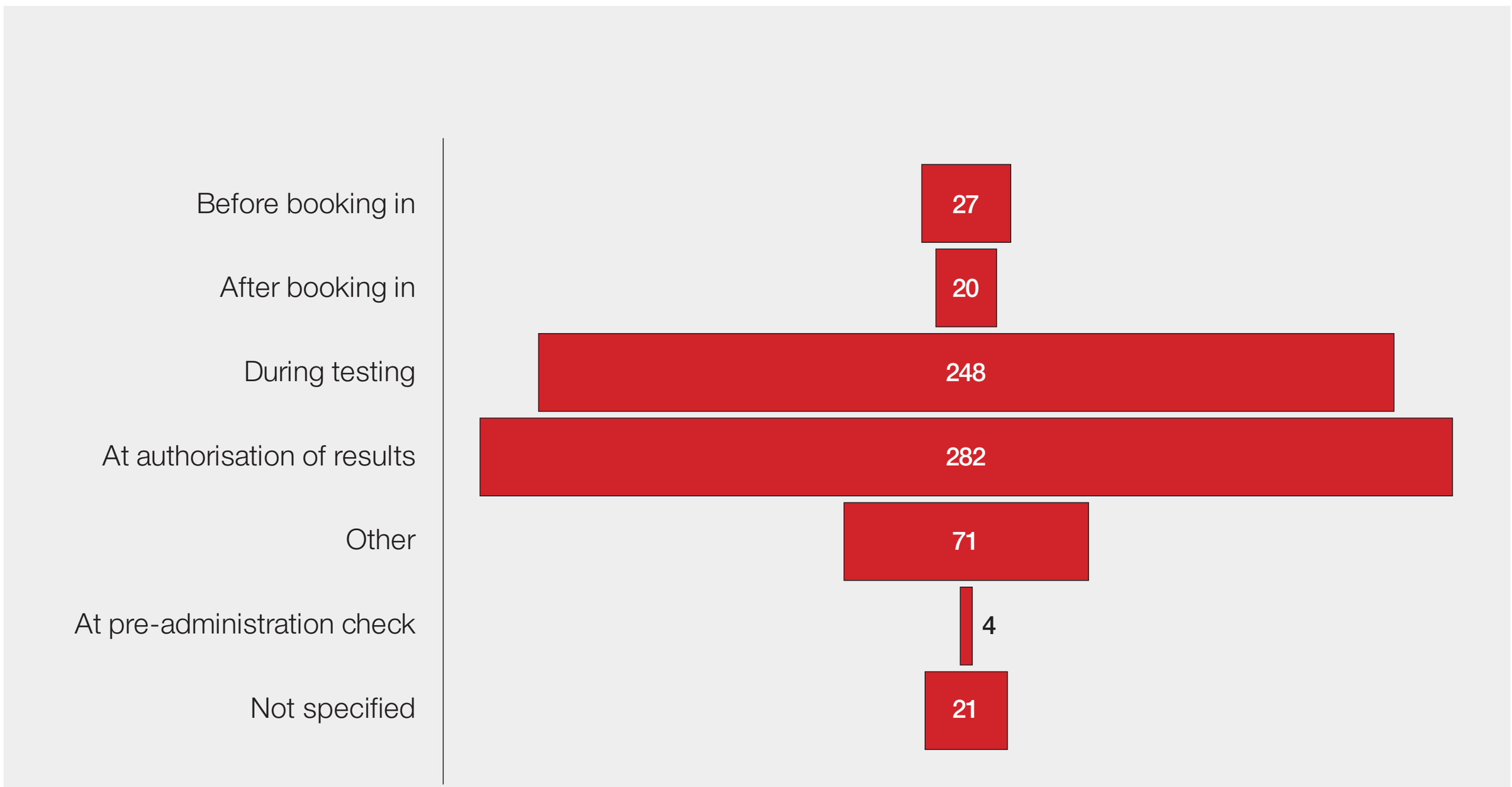


Figure 14.1: Breakdown of 2020 RBRP reports (n=207)

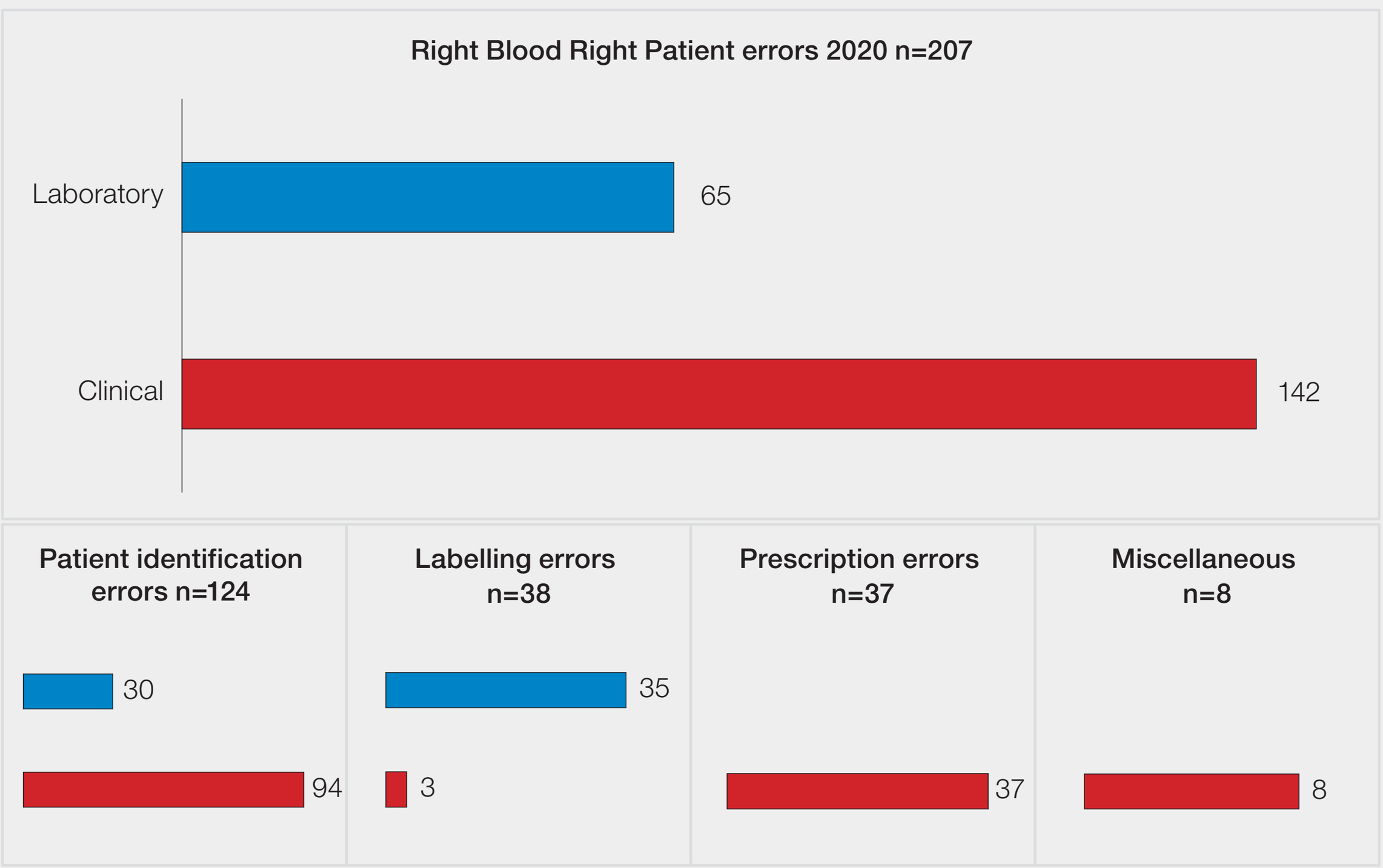
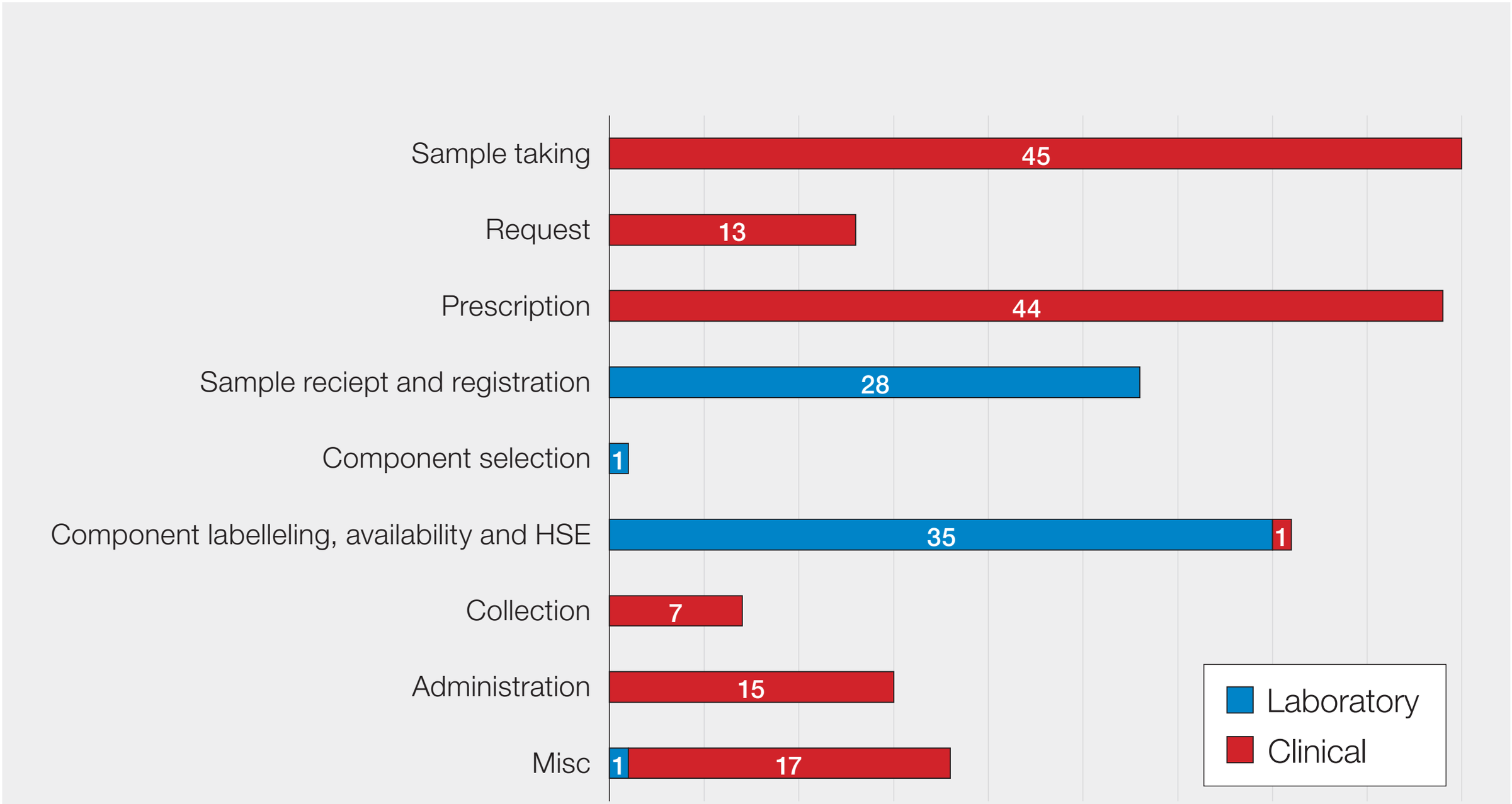
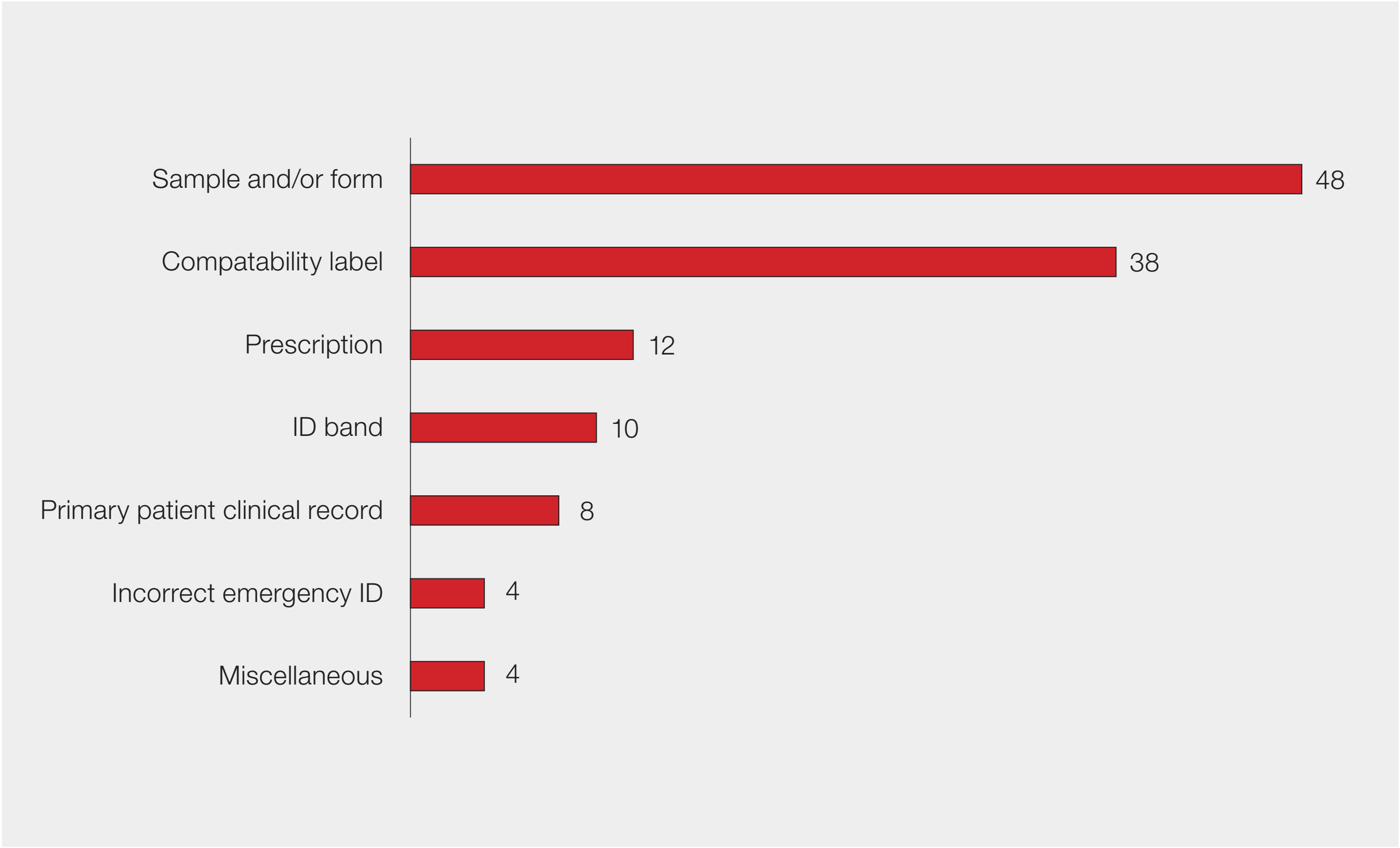


Figure 14.2: RBRP classified by the transfusion step in which the primary error occurred (n=207)



HSE=handling and storage errors

Figure 14.3: Details of patient identification errors (n=124)



ID= identification

Figure 14.4: The presence of a pre-administration check in RBRP errors (n=207)

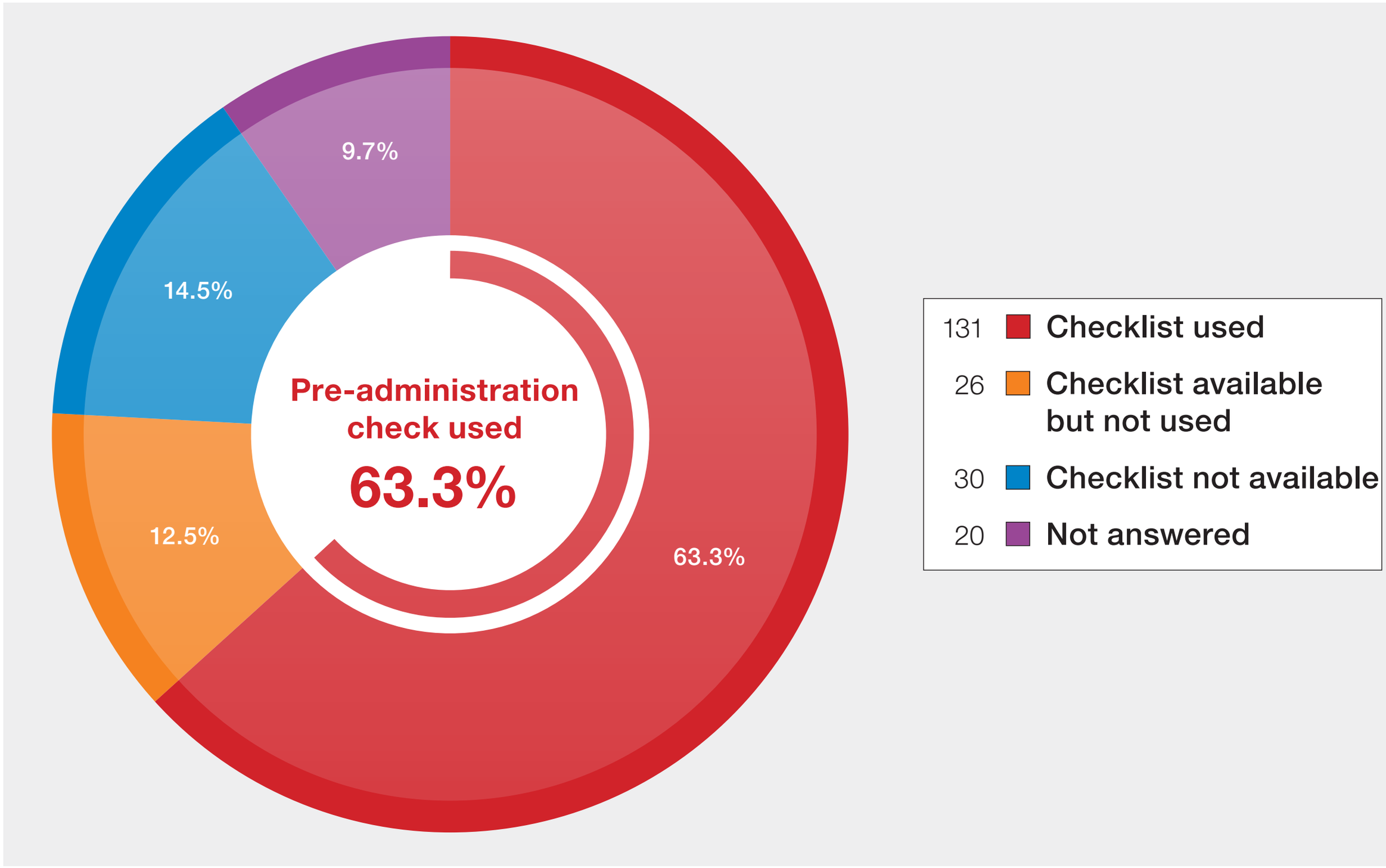


Figure 14.5: Type of pre-administration check used in RBRP incidents (n=131)

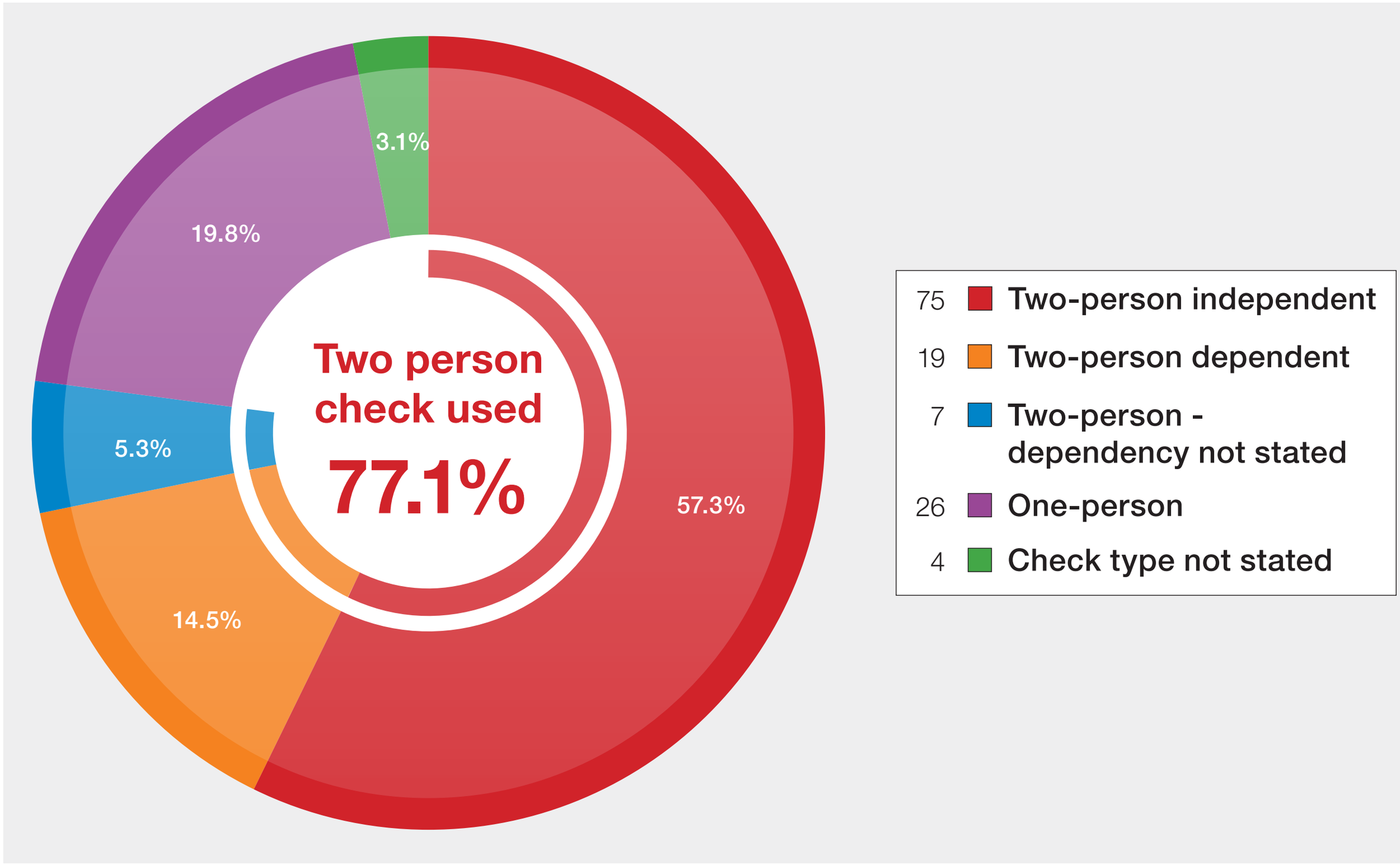


Figure 14.6: RBRP near misses 2018-2020

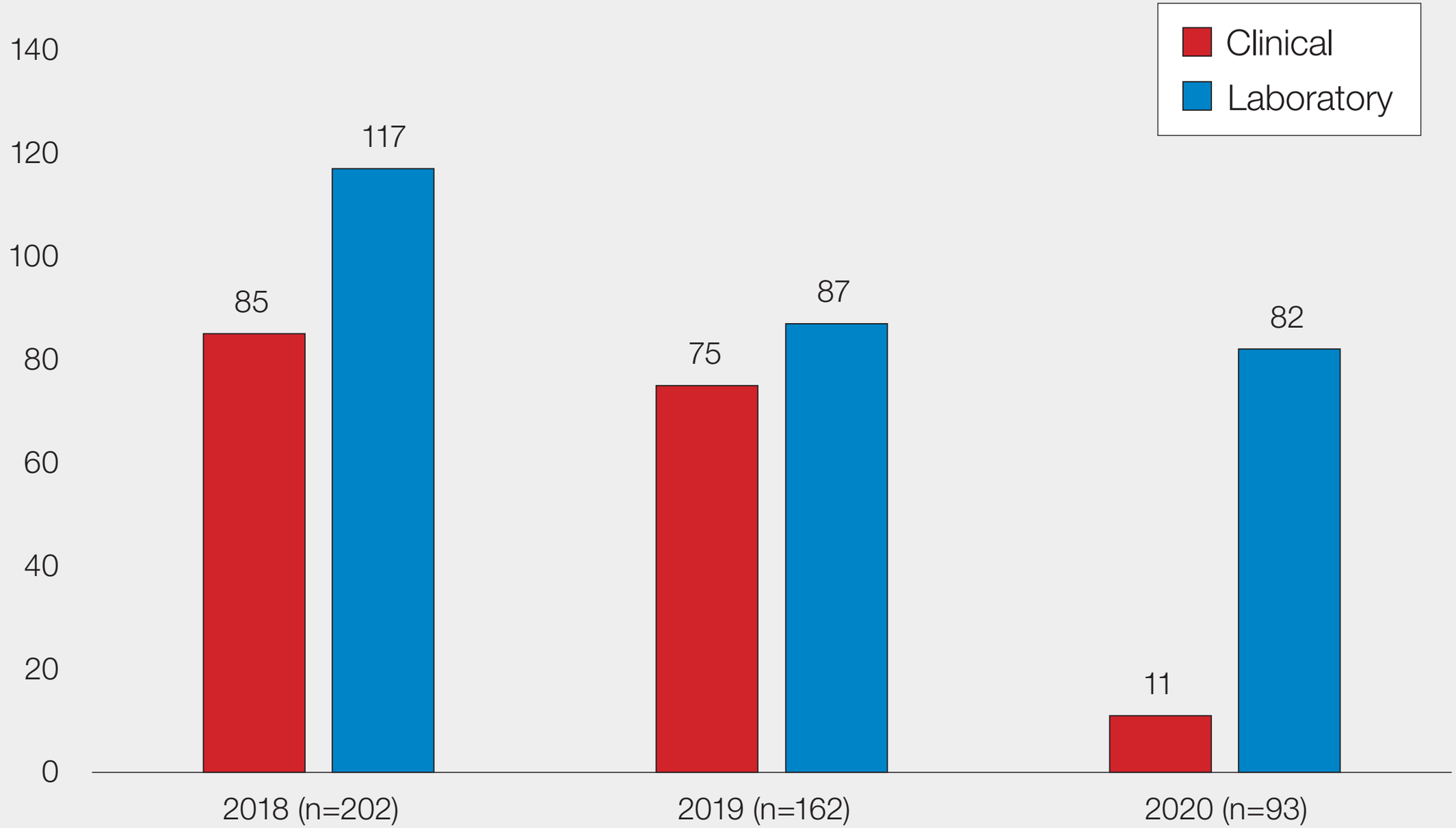


Figure 14.7: The PLEDGE aide memoire

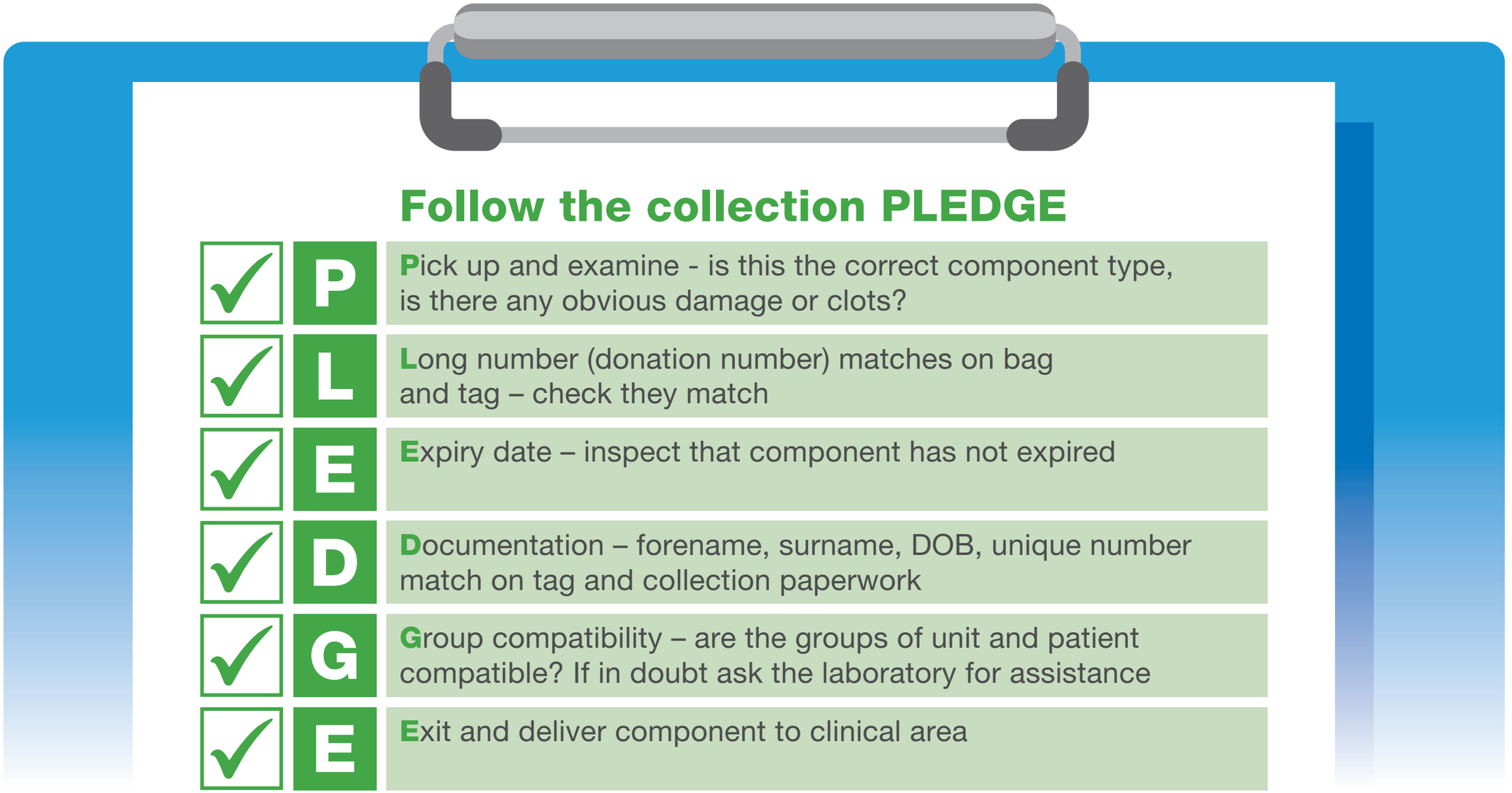


Figure 15.1: Laboratory errors 2016-2020 categorised by step where the error occurred

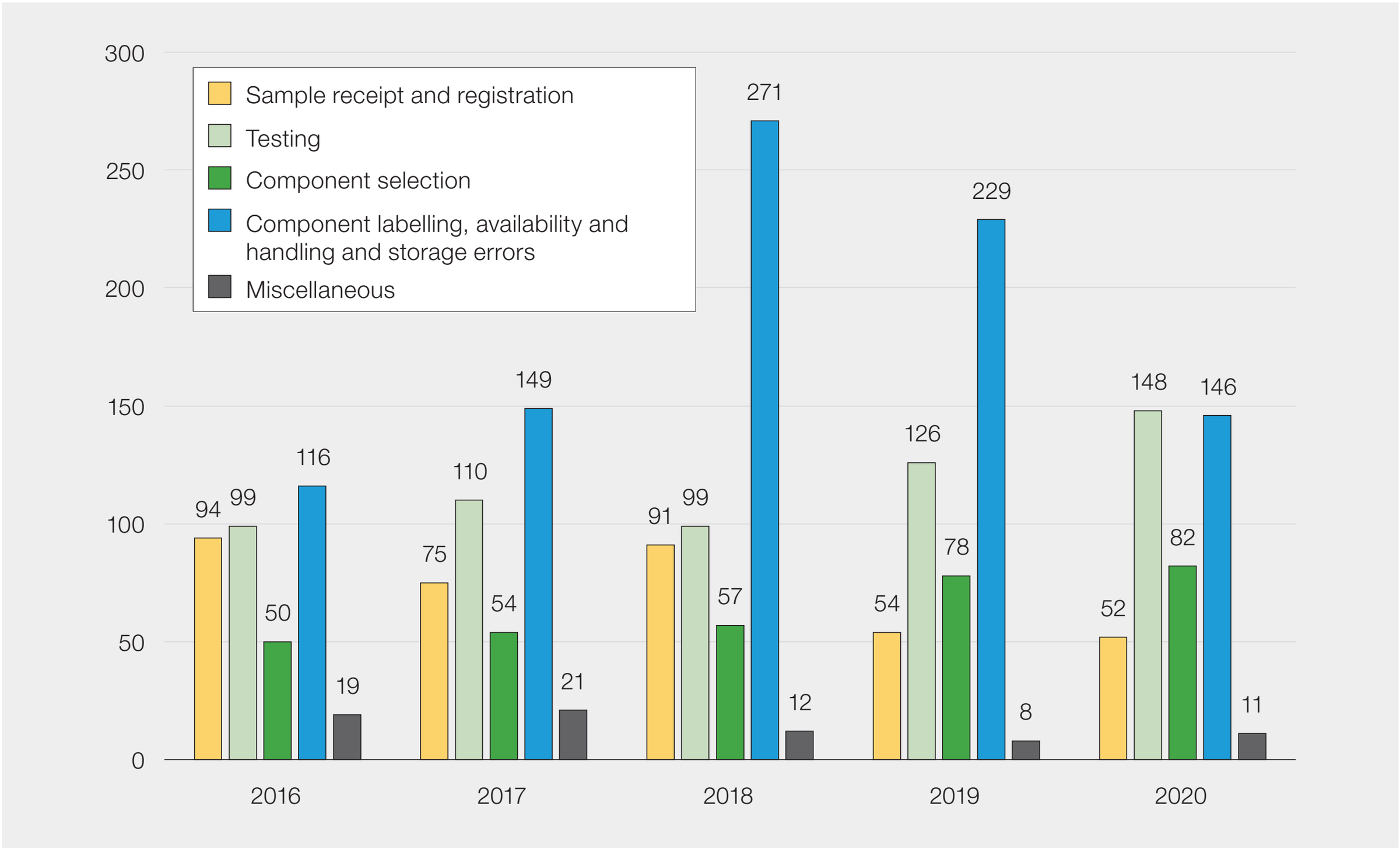
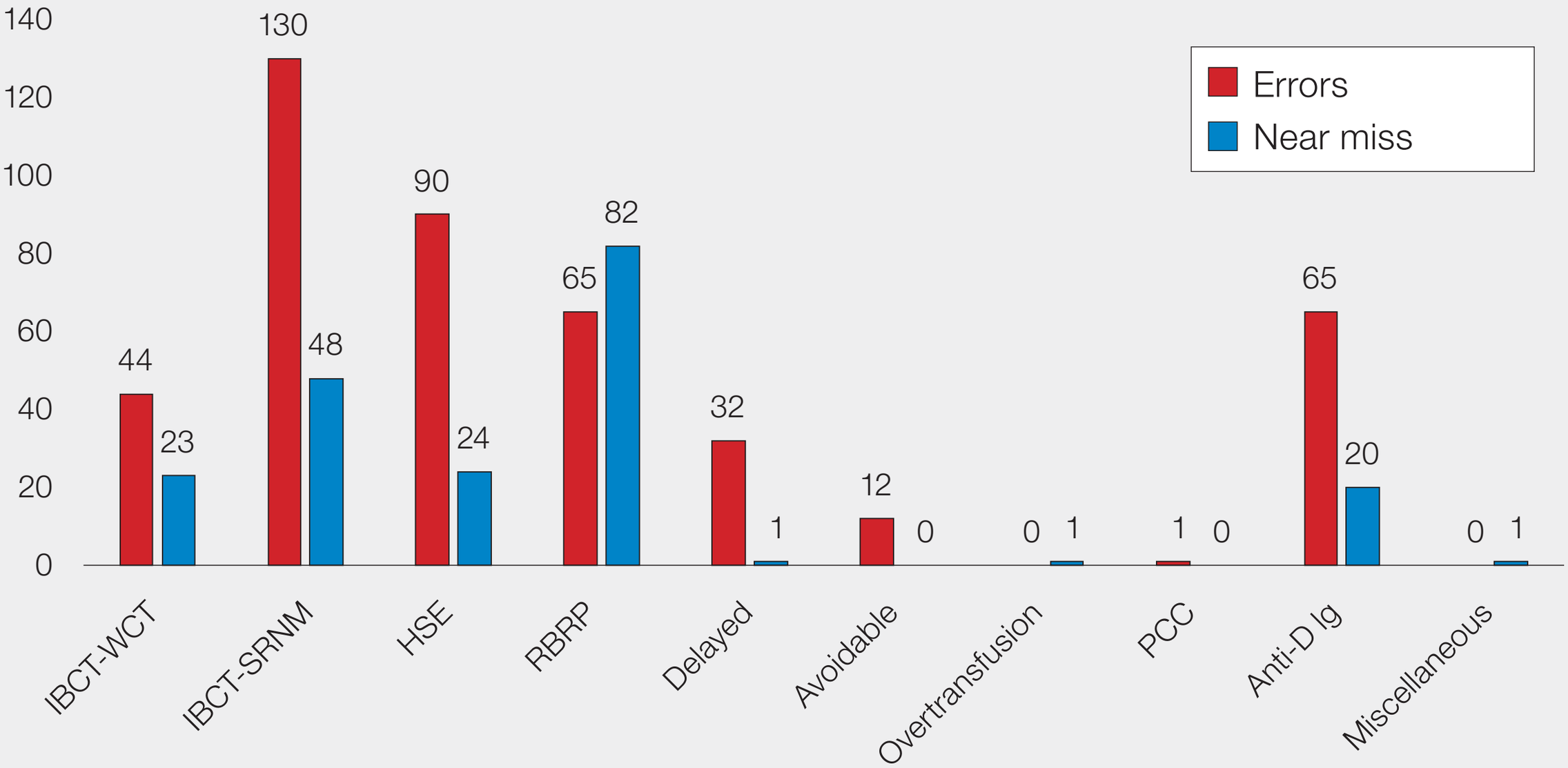
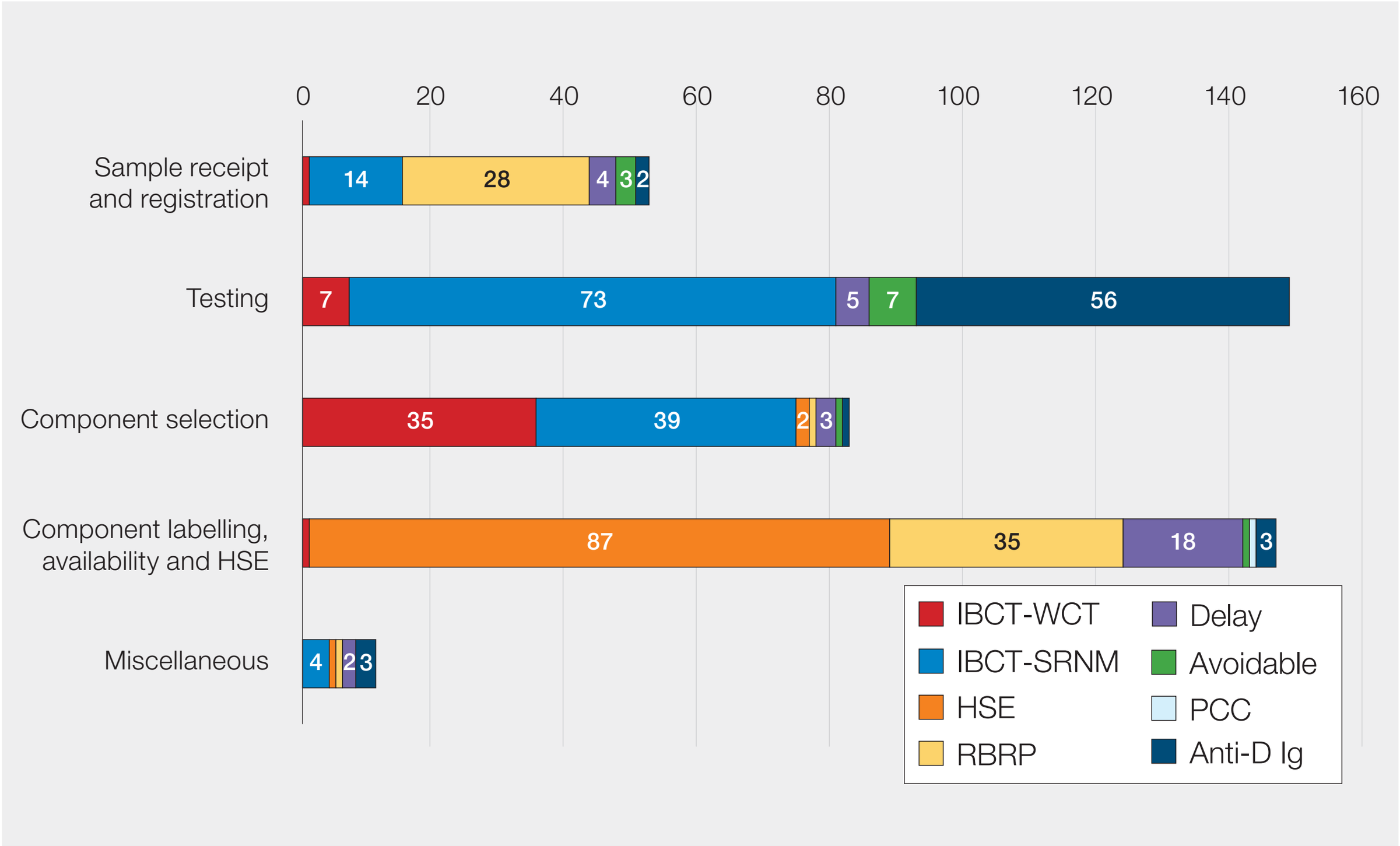


Figure 15.2: Laboratory incidents and near misses by category of outcome (n=639)



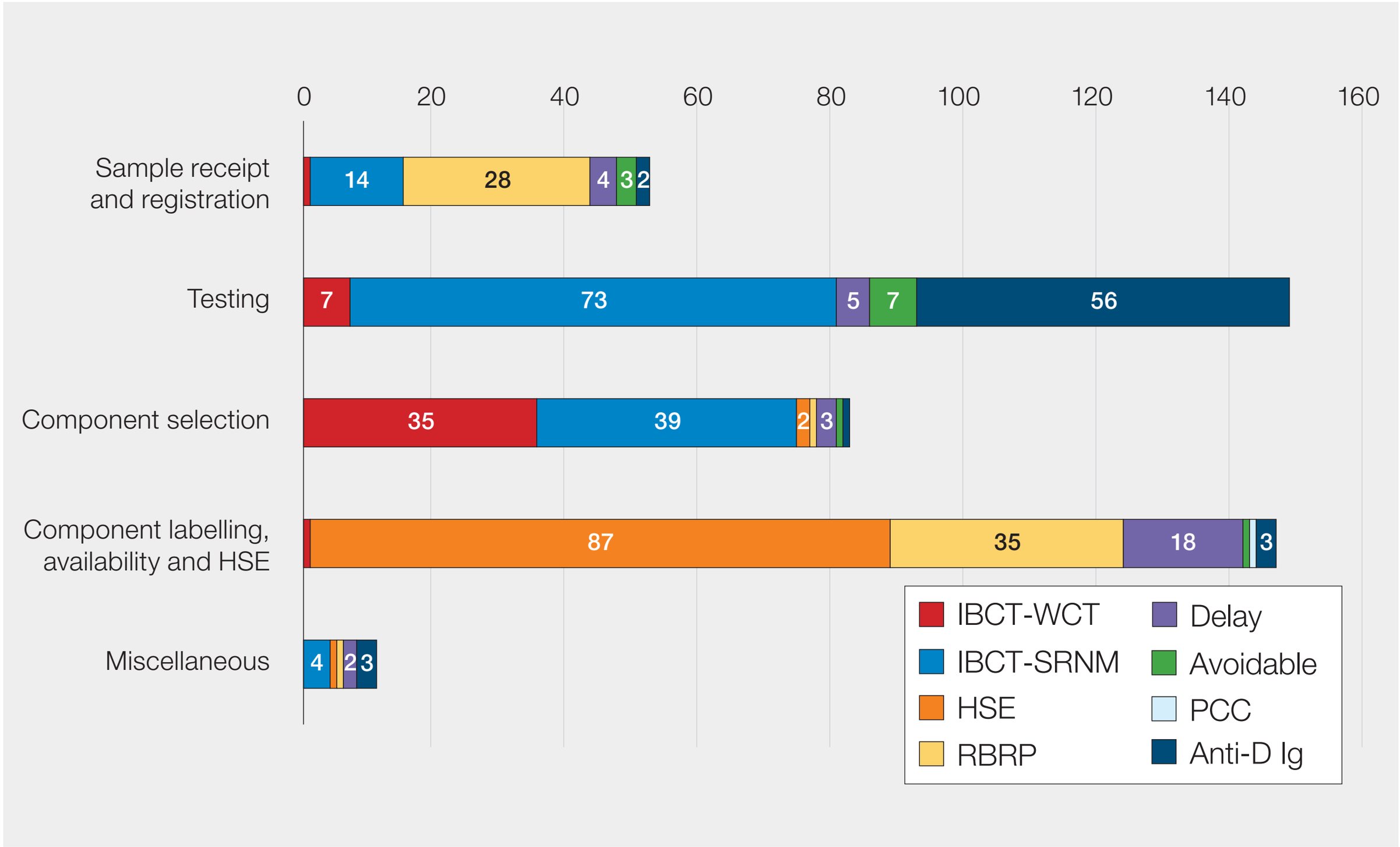
IBCT-WCT=incorrect blood component transfused-wrong component transfused; IBCT-SRNM=IBCT-specific requirements not met; HSE=handling and storage errors; RBRP=right blood right patient; PCC=prothrombin complex concentrate; Ig=immunoglobulin

Figure 15.3: SHOT laboratory data showing at which stage in the transfusion process the primary error occurred (n=439)



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 15.4: SHOT near miss laboratory errors showing at which stage in the transfusion process the primary error occurred with outcome (n=200)



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

Figure 15.5: IBCT-SRNM laboratory testing errors separated by error subcategory (n=73)

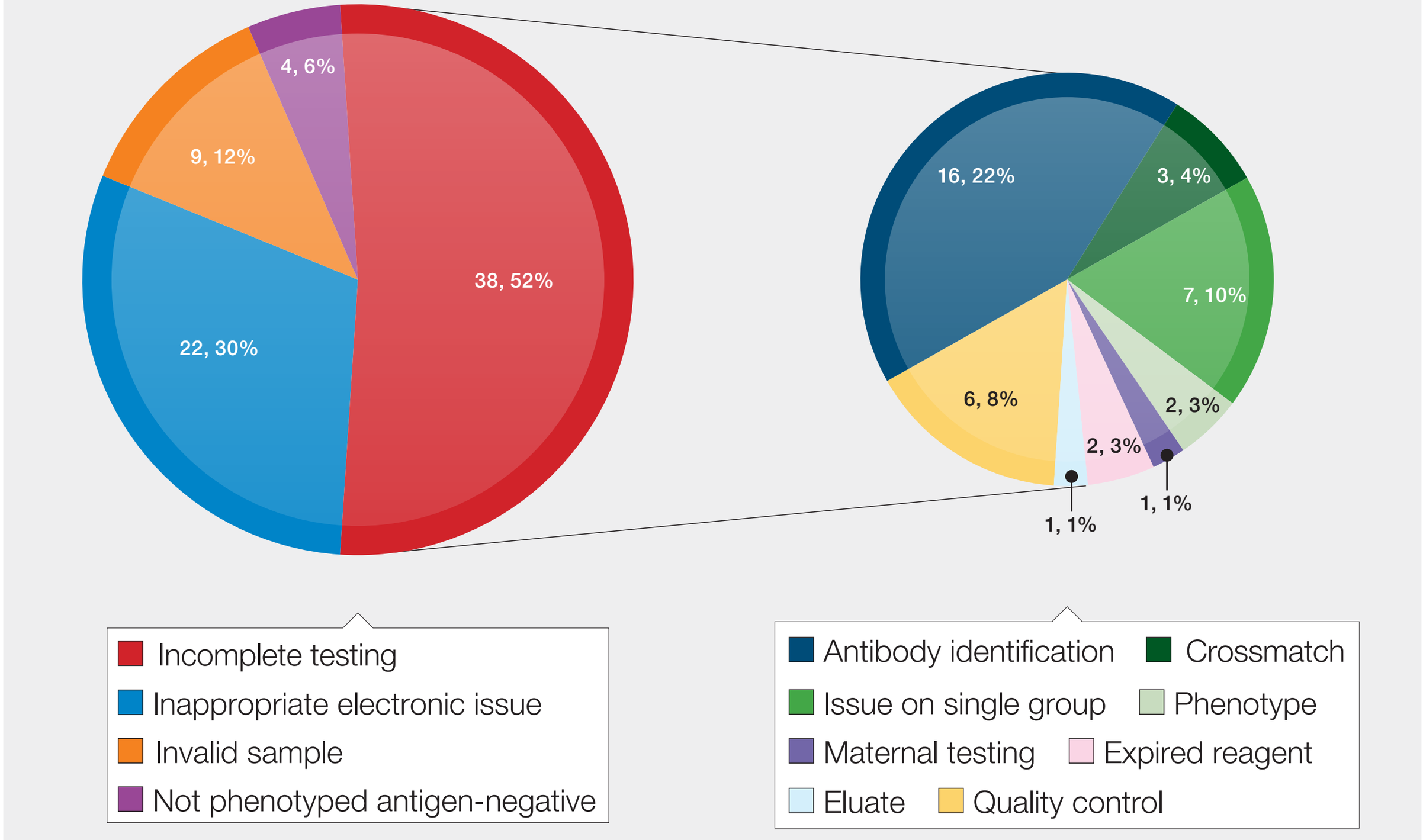
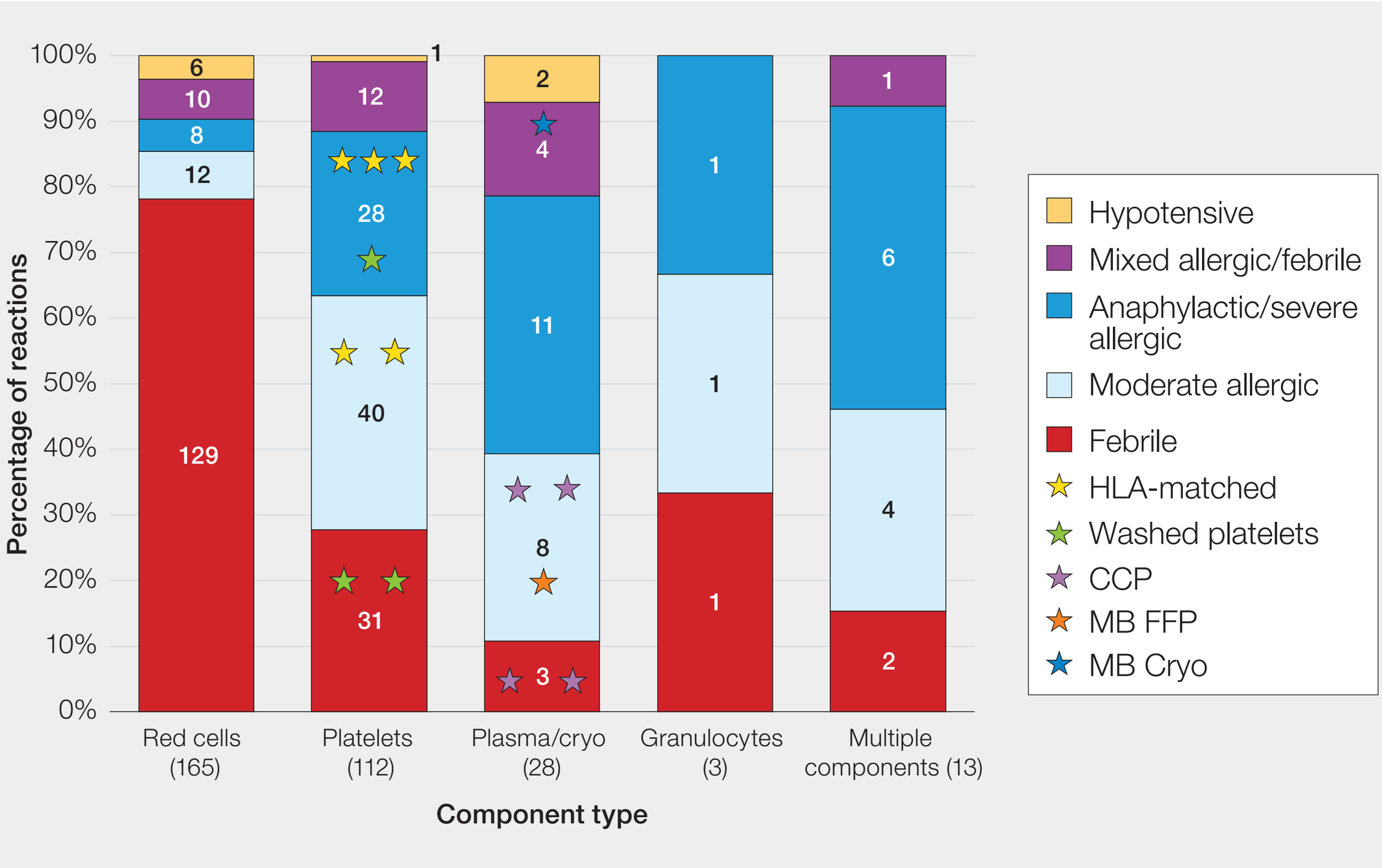
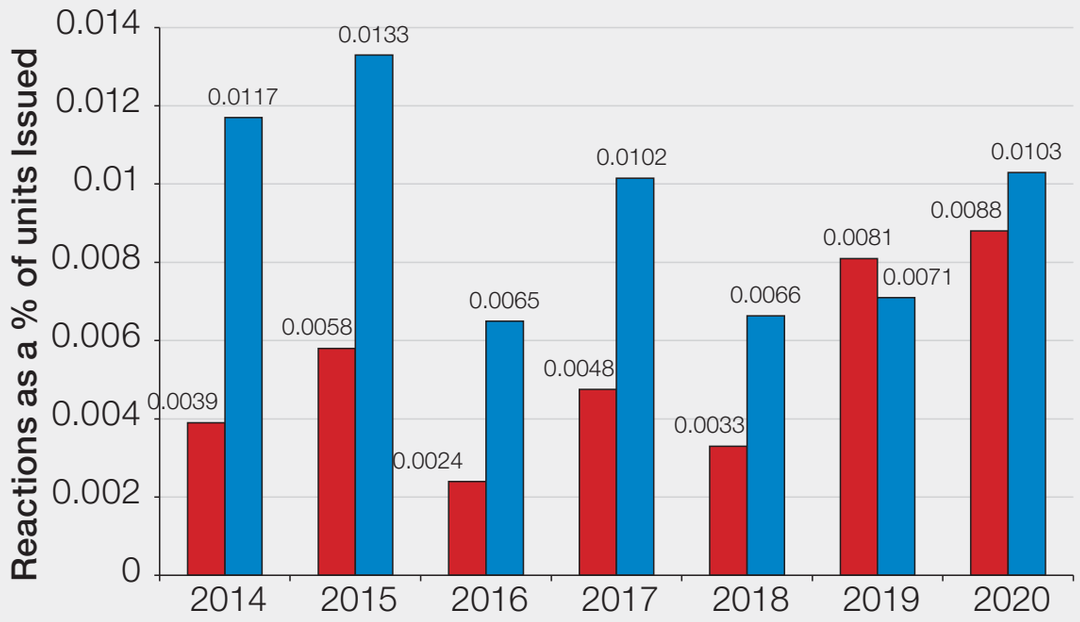


Figure 17.1: Reactions by component type

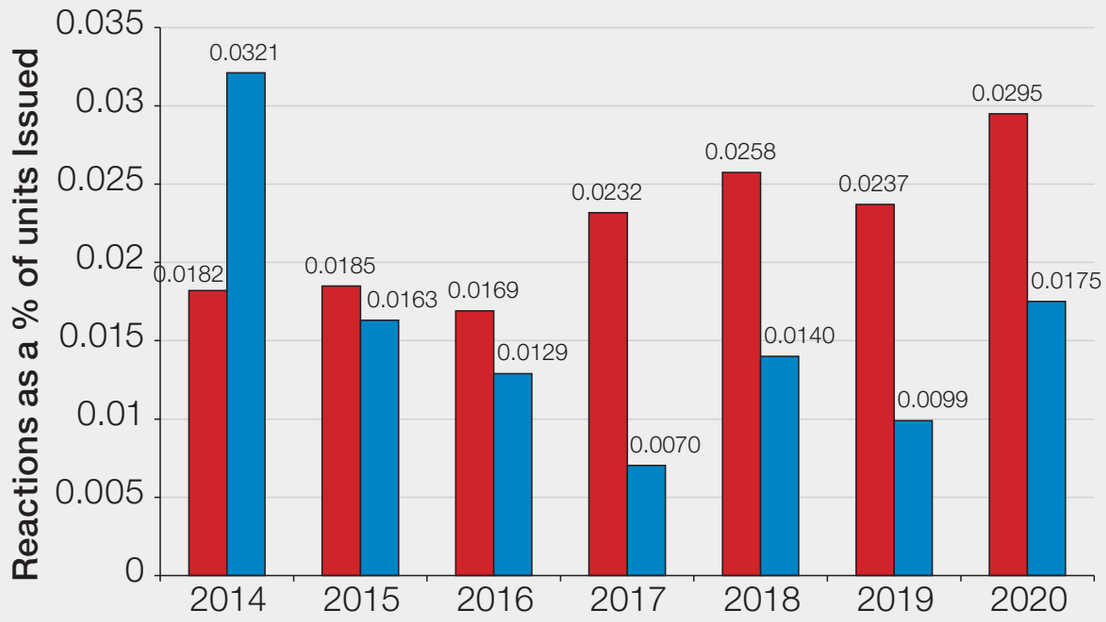


Figures 17.2: Percentage of reactions to apheresis and pooled platelets 2014 to 2020

a: Febrile-type reactions

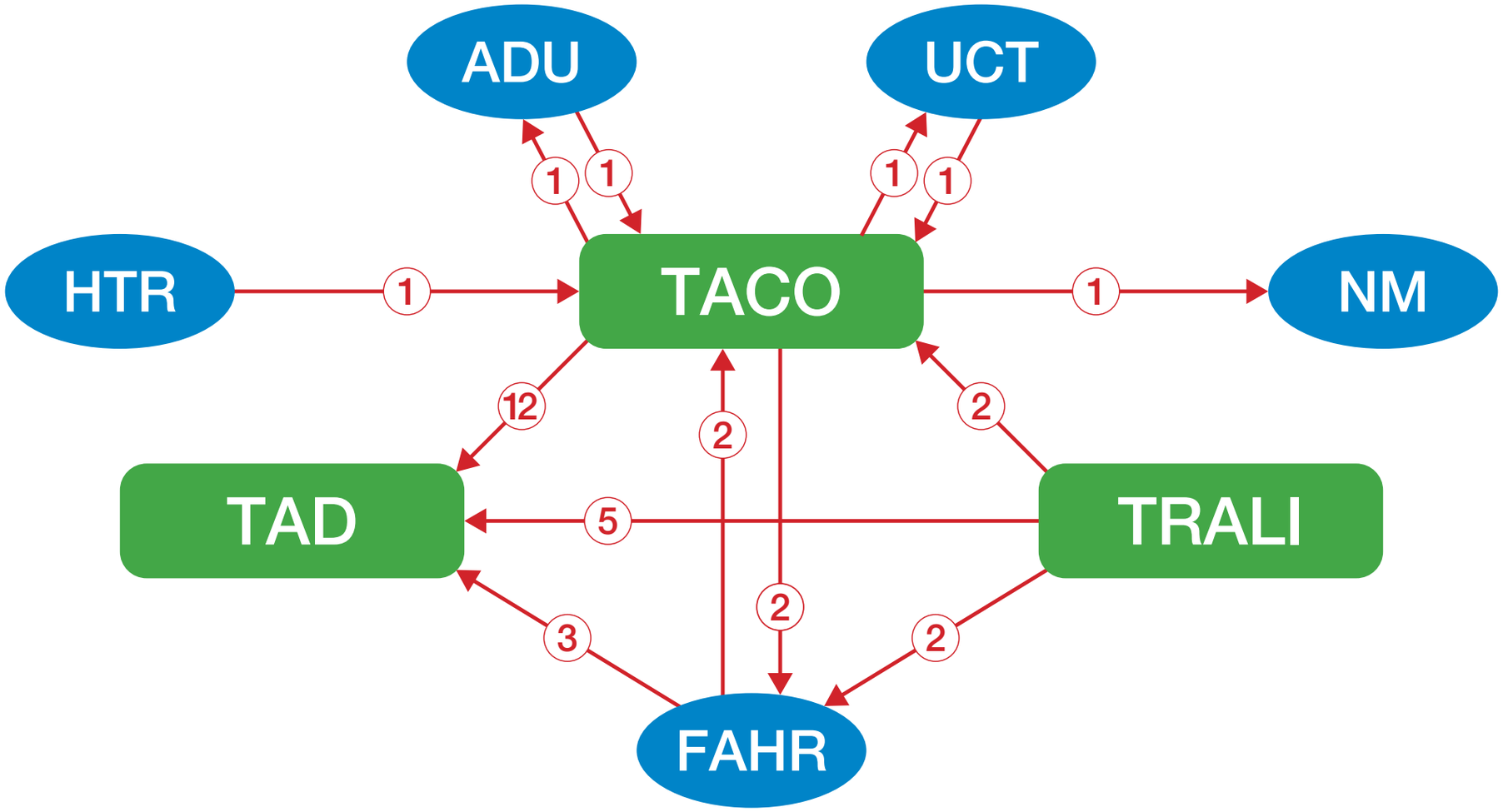


b: Allergic reactions



Apheresis Pooled

Figure 18.1: Case transfers to and from the pulmonary categories in 2020 (n=34)



TACO=transfusion-associated circulatory overload; TRALI=transfusion-related acute lung injury; TAD=transfusion-associated dyspnoea; HTR=haemolytic transfusion reactions; ADU=avoidable, delayed or under/overtransfusion; FAHR=febrile, allergic and hypotensive reactions; UCT=uncommon complications of transfusion; NM=near miss

Figure 18a.1: Conceptual relationship between TRALI, ALICT and donor antibody

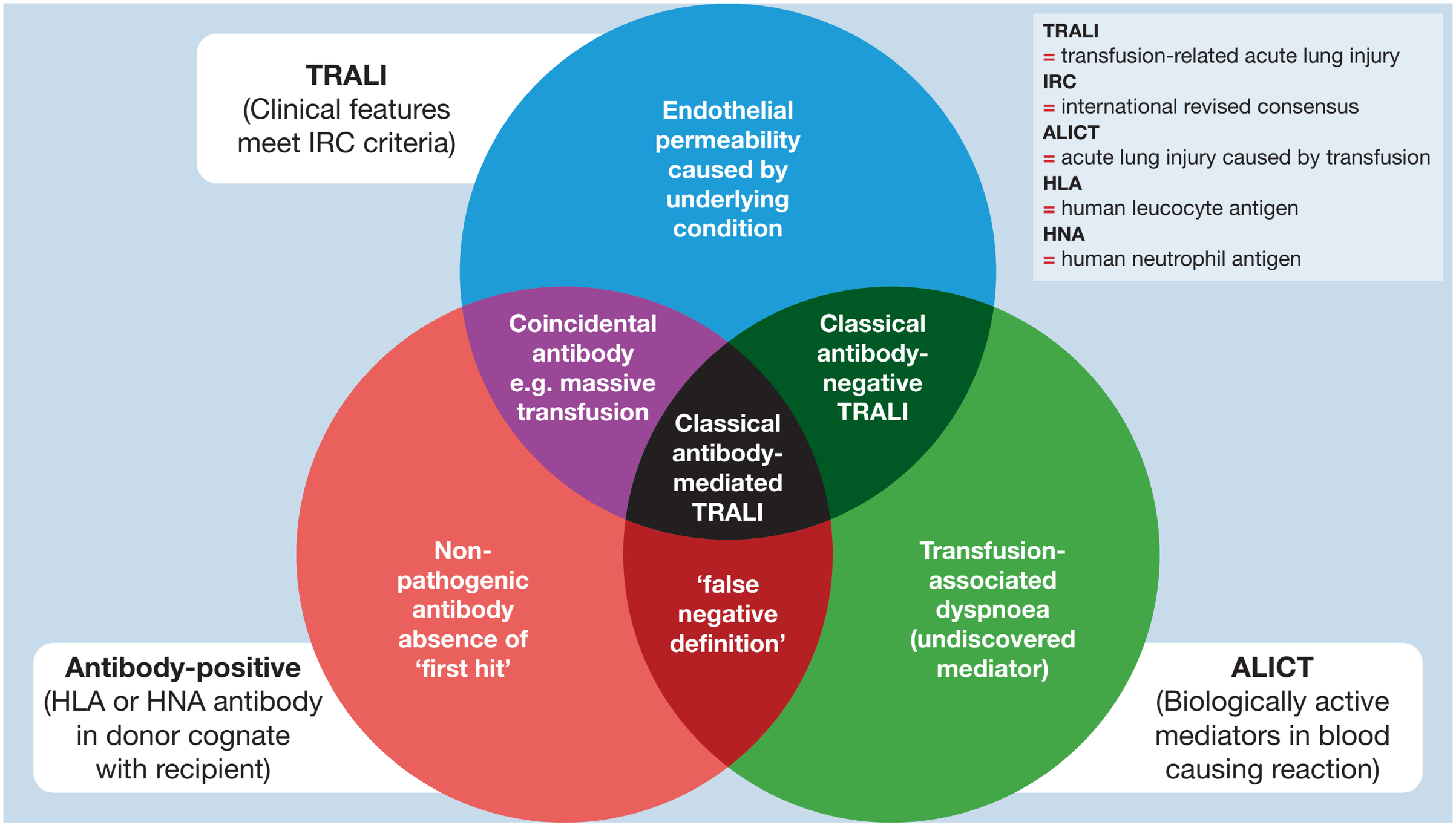
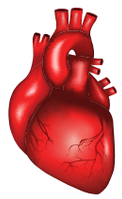
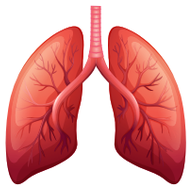


Figure 18b.1: TACO pre-transfusion checklist

TACO Checklist	Patient 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	
Monitor vital signs closely, including oxygen saturation	

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

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

Figure 18b.2: Number of TACO surveillance criteria versus number of accepted TACO cases

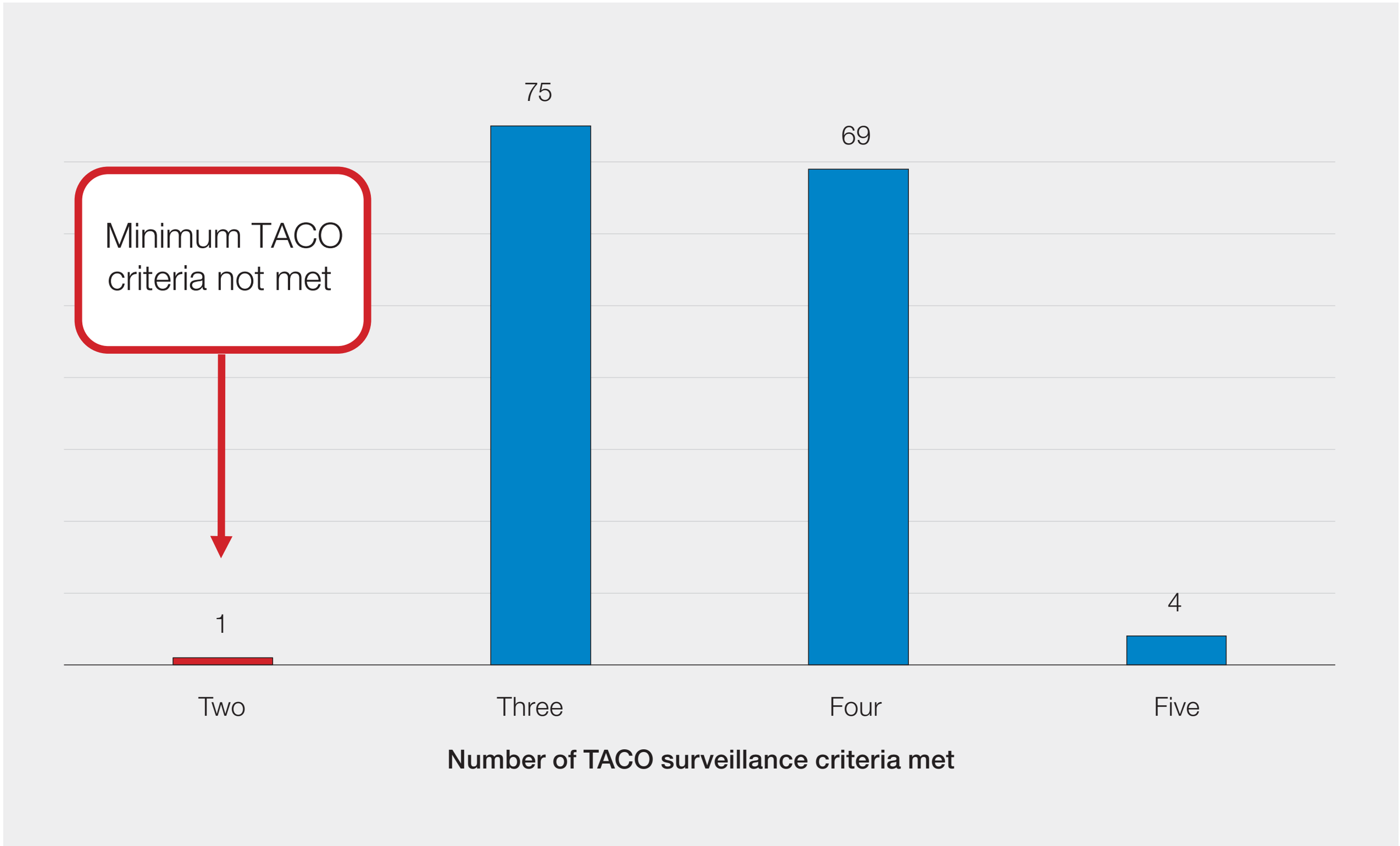


Figure 18b.3: Use of the checklist to identify patients at risk of TACO and implementation of mitigations

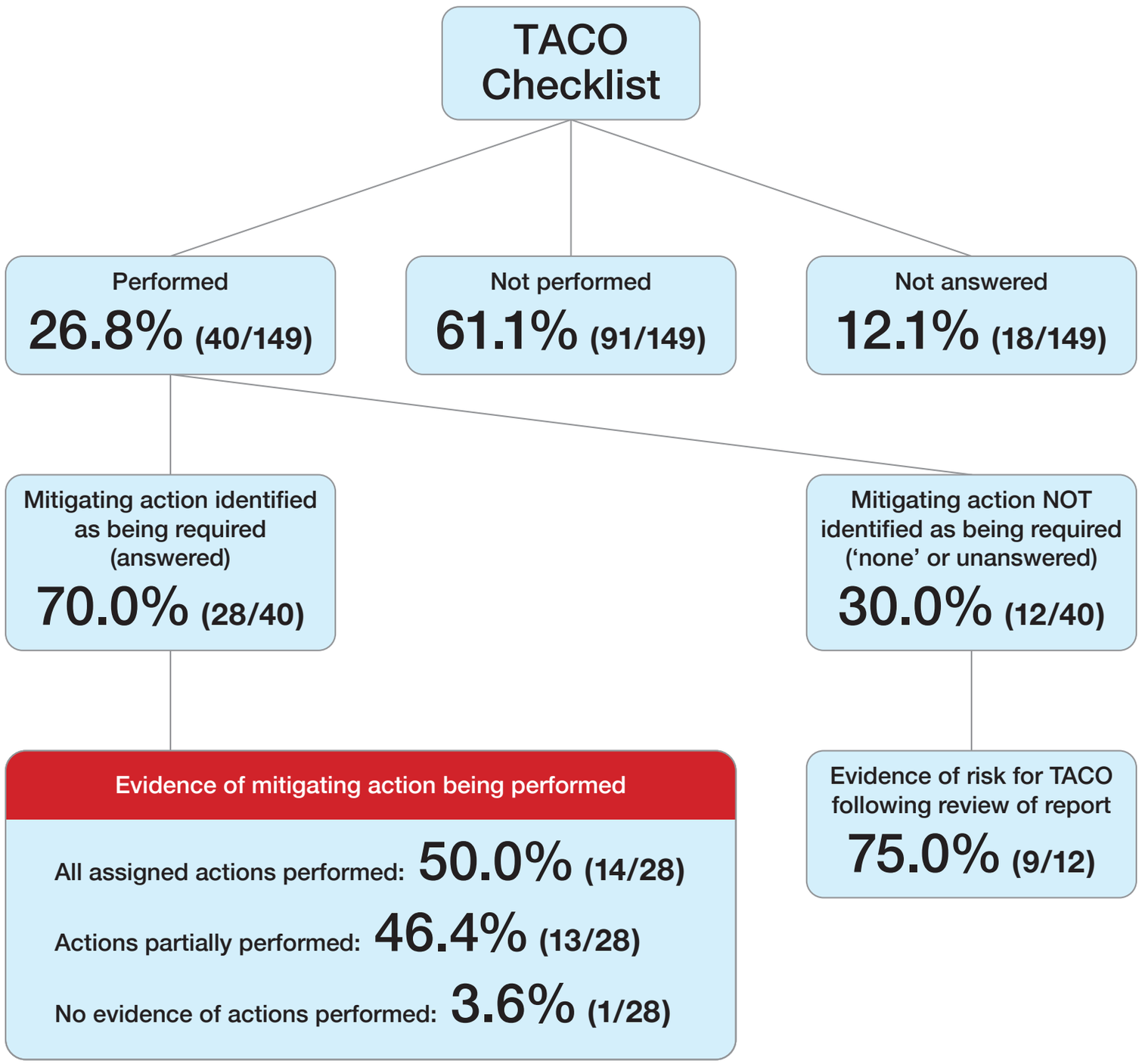
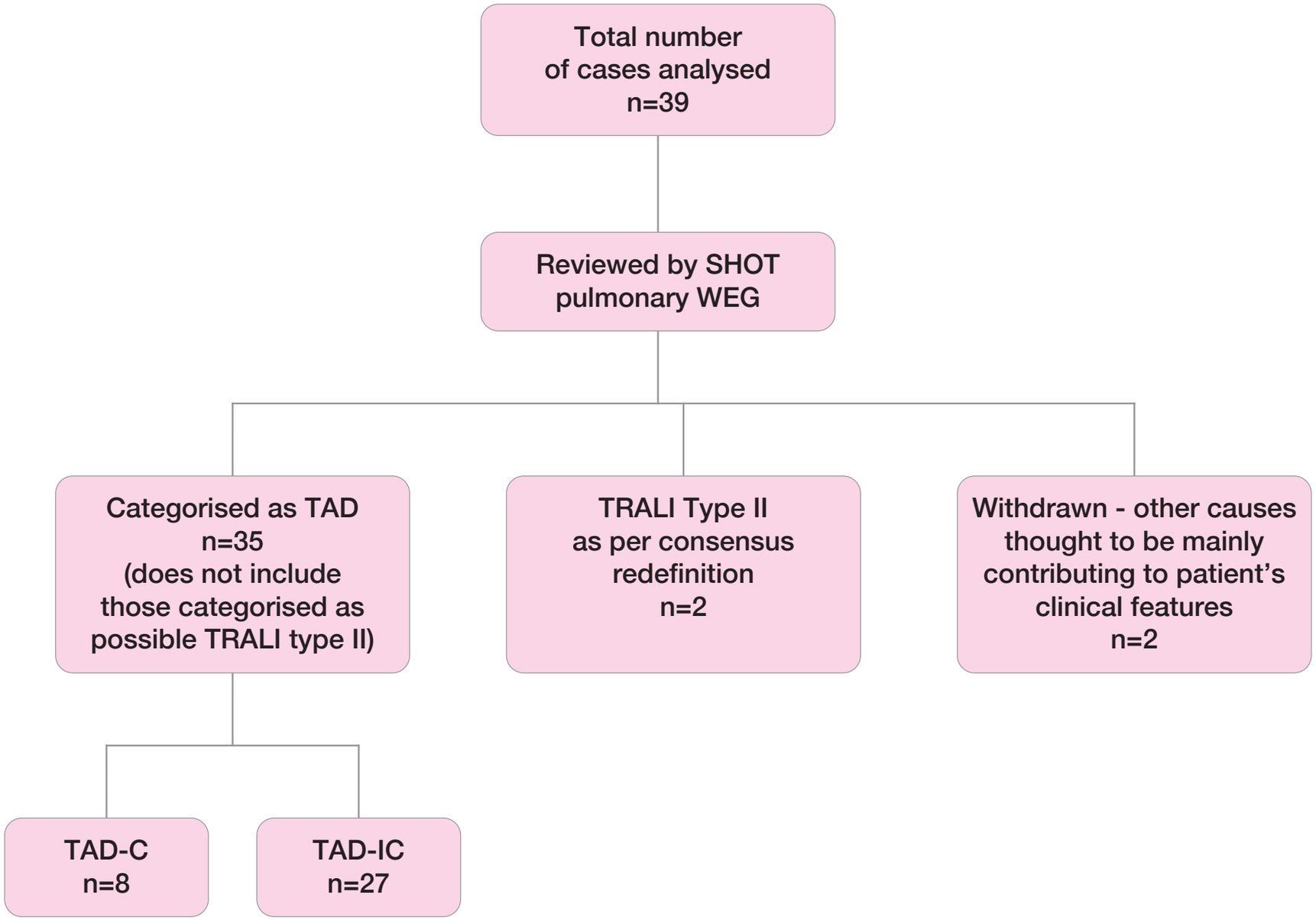


Figure 18c.1: Summary of cases included under TAD



TAD=transfusion-associated dyspnoea; TAD-C=TAD with adequate clinical information; TAD-IC=TAD with inadequate clinical information; TRALI=transfusion-related acute lung injury; WEG=working expert group

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

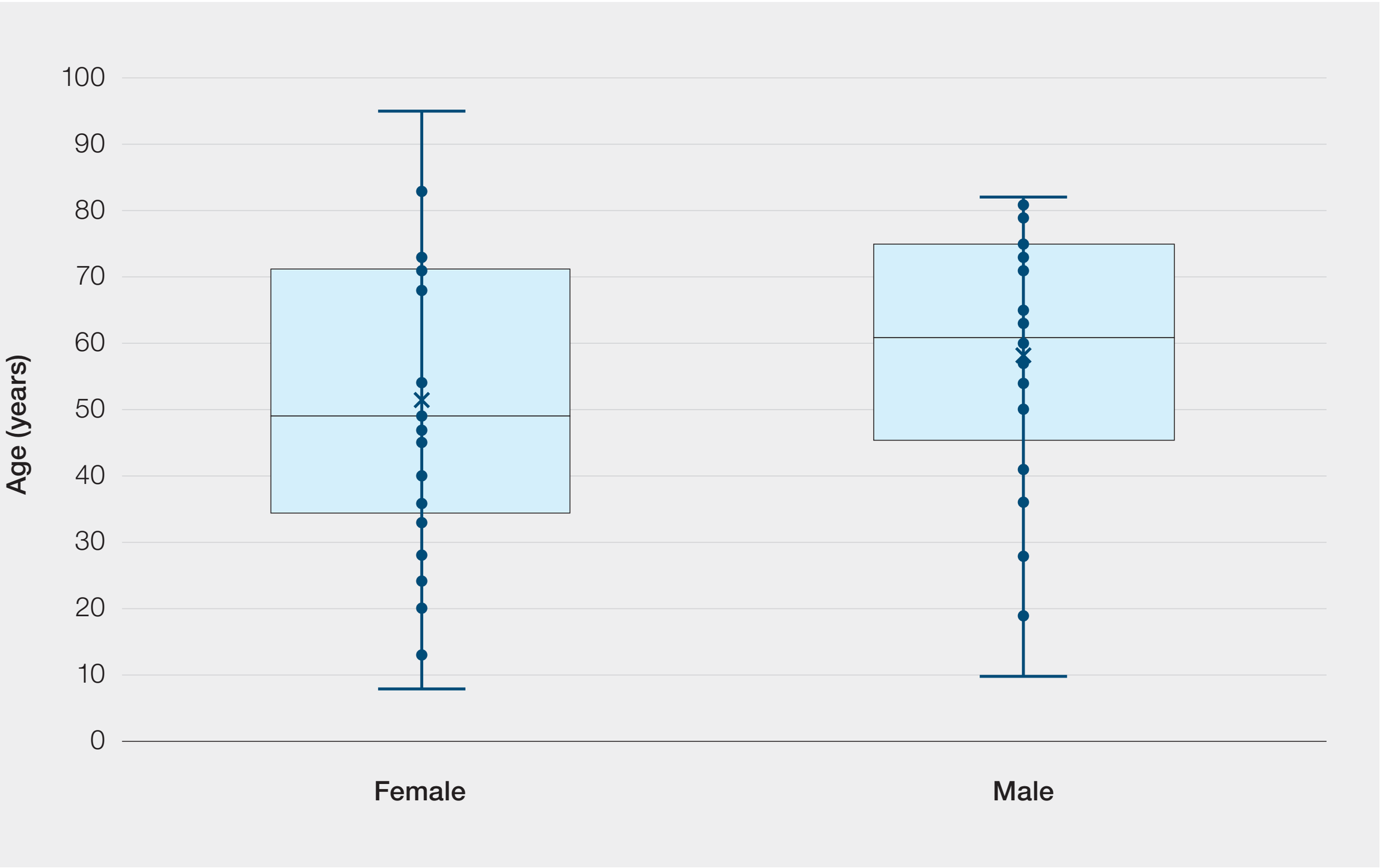


Figure 19.1 is a box and whisker diagram showing the median age and the age range of patients experiencing a HTR reported to SHOT separated by gender. The middle bar in the shaded box indicates the median age, the outer bars of the box represent the upper and lower quartiles. The lines extending from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

Figure 19.2: Clinical symptoms reported in AHTR

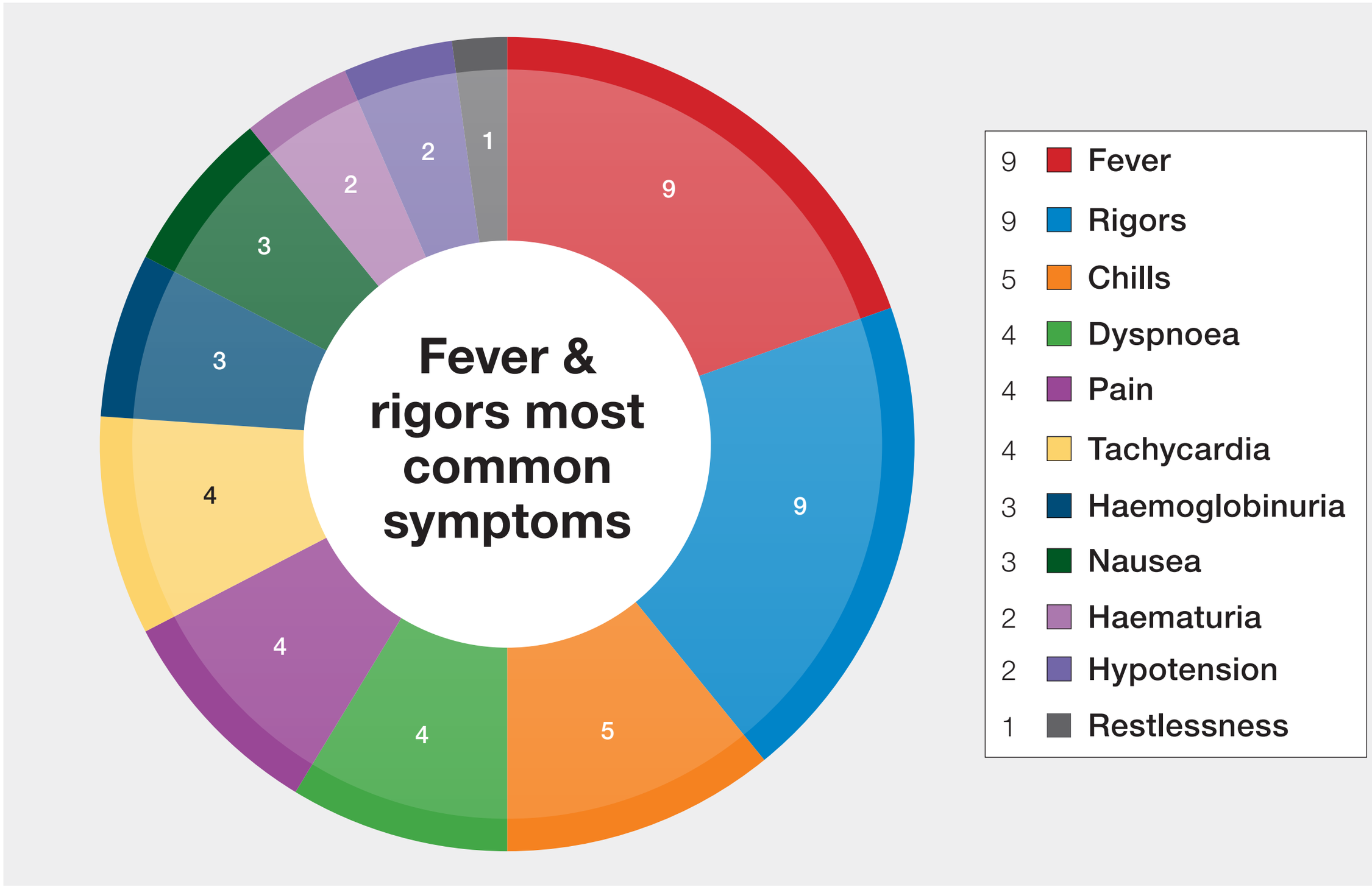


Figure 19.3: Antibody specificities implicated in HTR

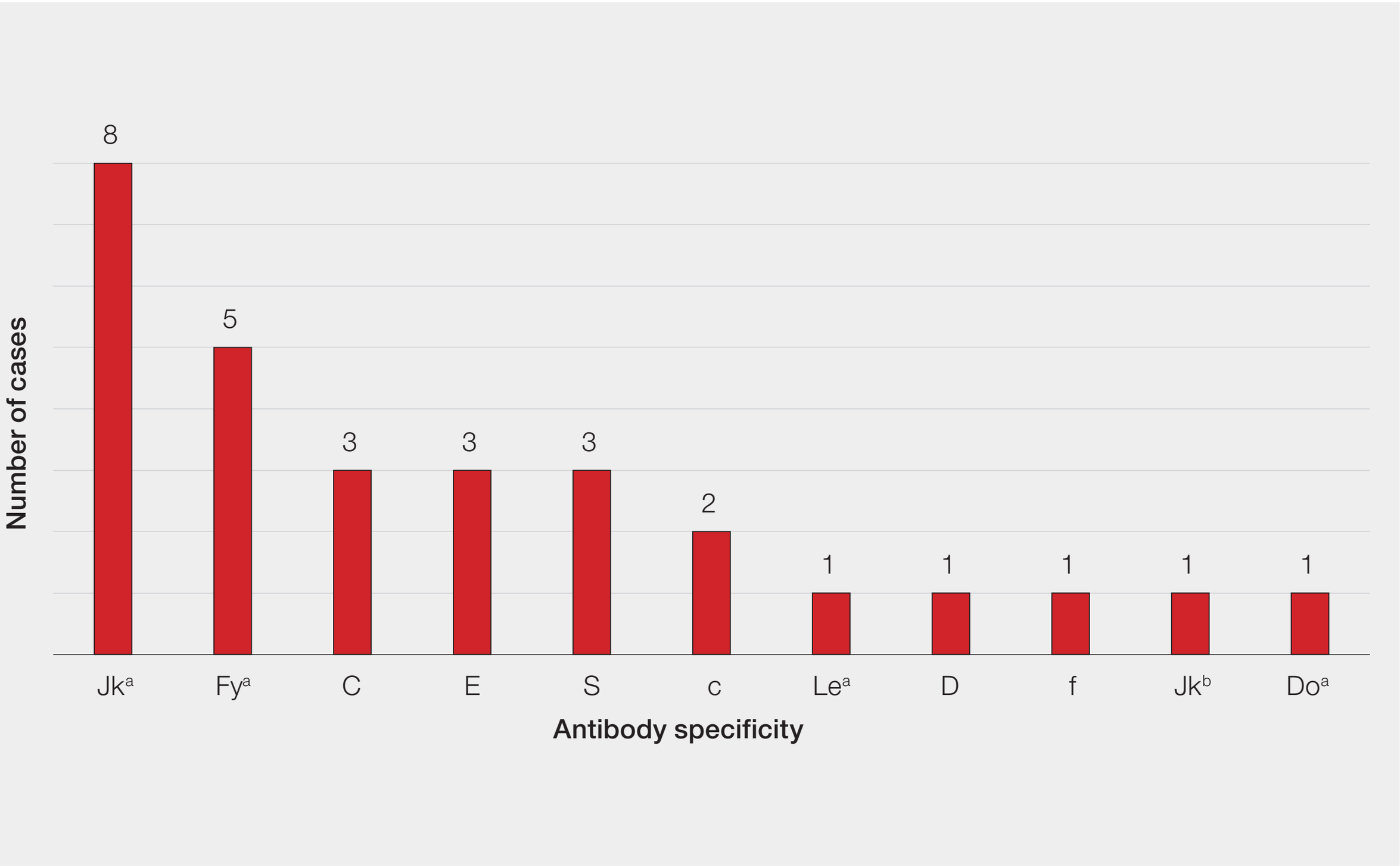
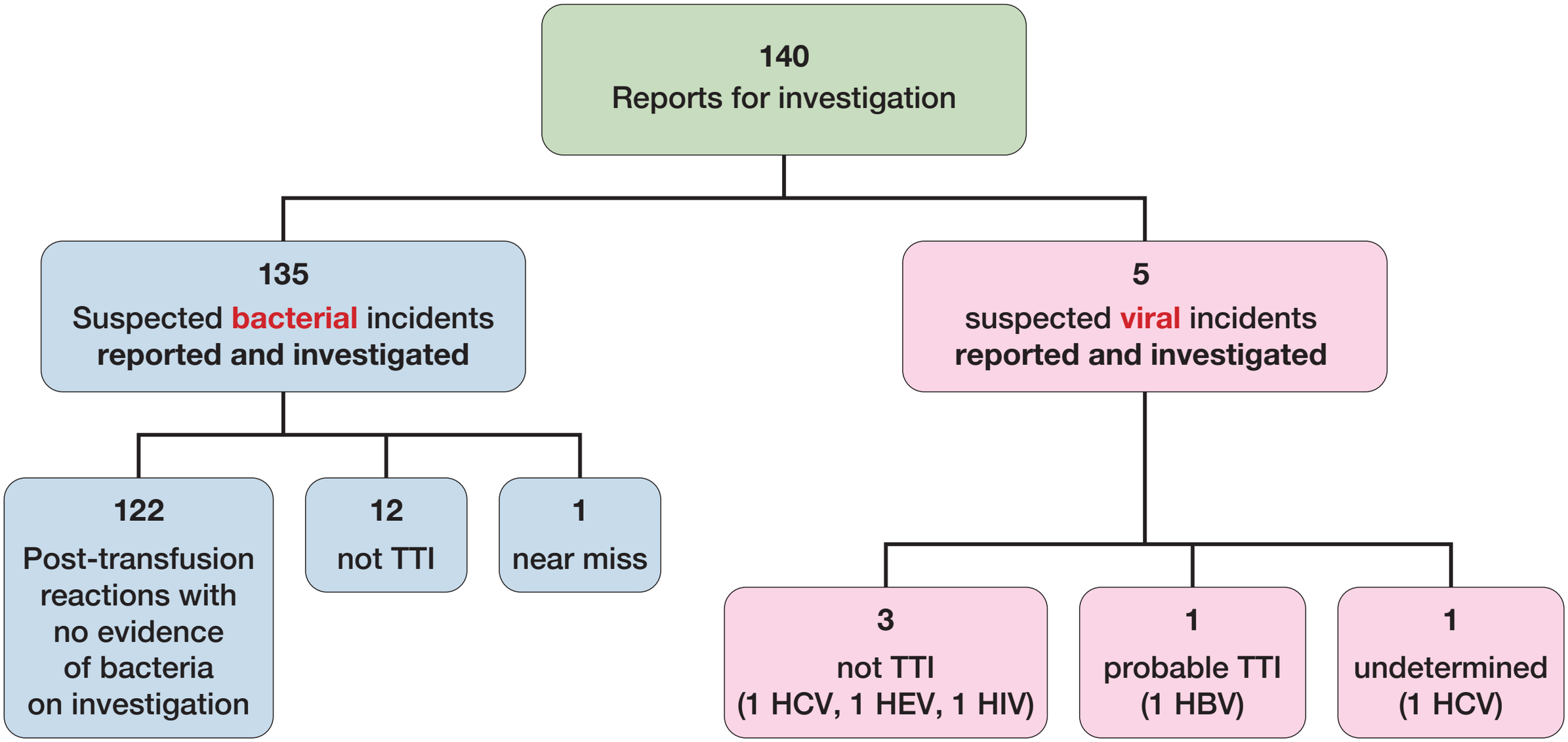


Figure 21.1: Outcome of reports of suspected TTI made to the NHSBT/PHE Epidemiology Unit in 2020 update



TTI = transfusion-transmitted infection; HCV = hepatitis C virus; HEV = hepatitis E virus; HIV = human immunodeficiency virus; HBV = hepatitis B virus

Note:

- *The undetermined HCV case was related to donations from 1990, which was before HCV screening was introduced*
- *A PTR occurs when a blood transfusion recipient develops a reaction following a transfusion and bacteria were suspected. However, no bacteria were cultured in the recipient, units or donor(s), i.e. no evidence of any bacterial contamination*
- *A confirmed TTI is classified as in the above TTI definition with evidence that the virus/bacterium is indistinguishable on molecular typing between patient and donor/pack*
- *A probable TTI is classified as a TTI as in the above definition, but where molecular typing cannot be carried out to confirm this*
- *Not a TTI is defined as an investigation that concluded the infection in the recipient was NOT caused by transfusion, either as no infected donors identified (after all donors traced) or bacteria/virus identified in the recipient, but all units cleared (no bacteria/virus) in the unit and/or implicated donors*
- *A near miss is defined as either an infection was identified in the unit due to be transfused however the unit was NOT used in transfusion (e.g. bacterial growth seen in unit and returned to bacteriology laboratory prior to transfusion for investigation) or an infected donor calls post donation, and the unit is recalled and infection found in unit before it is transfused*

Figure 23.1: Trends in paediatric reports from 2010-2020

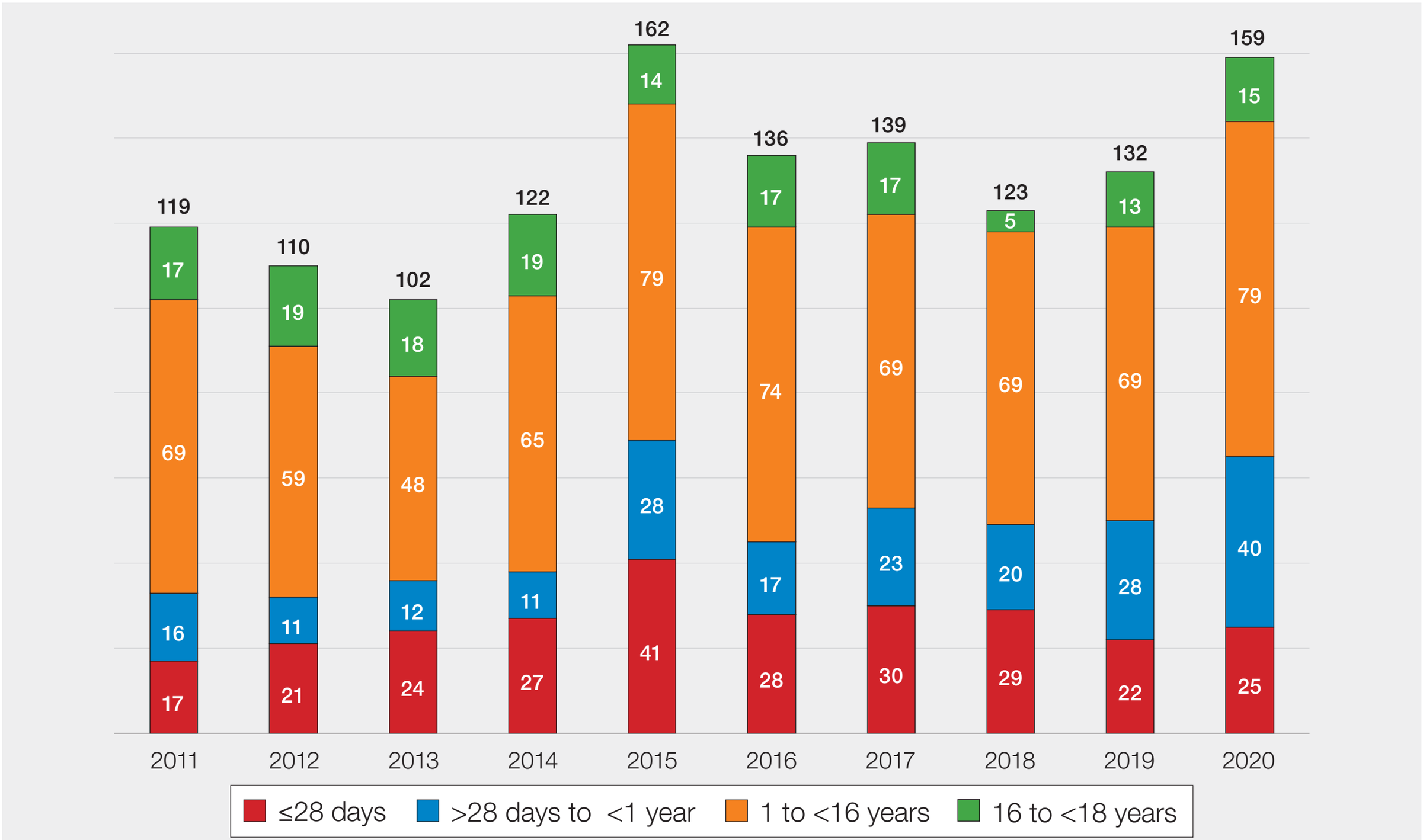
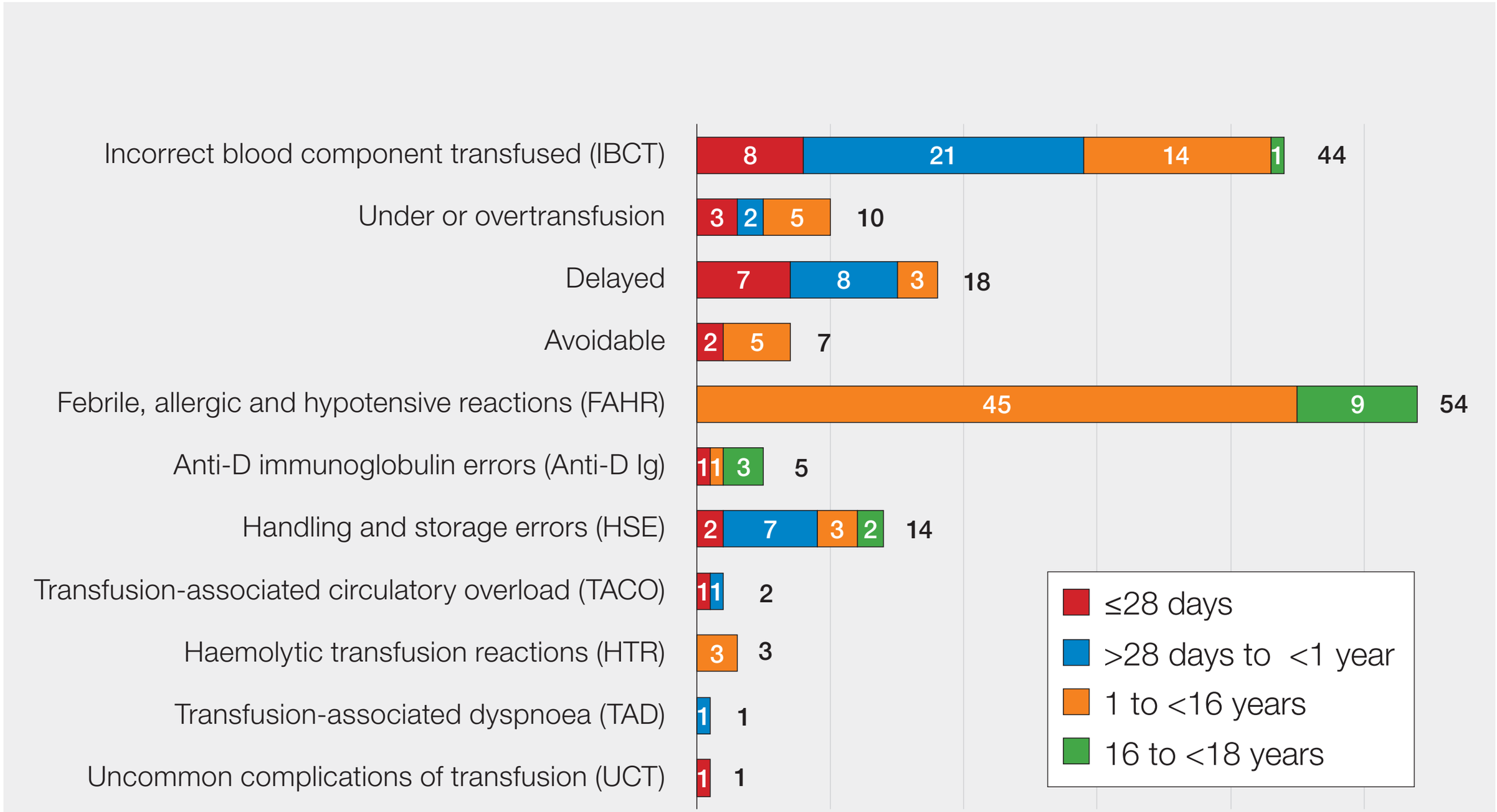
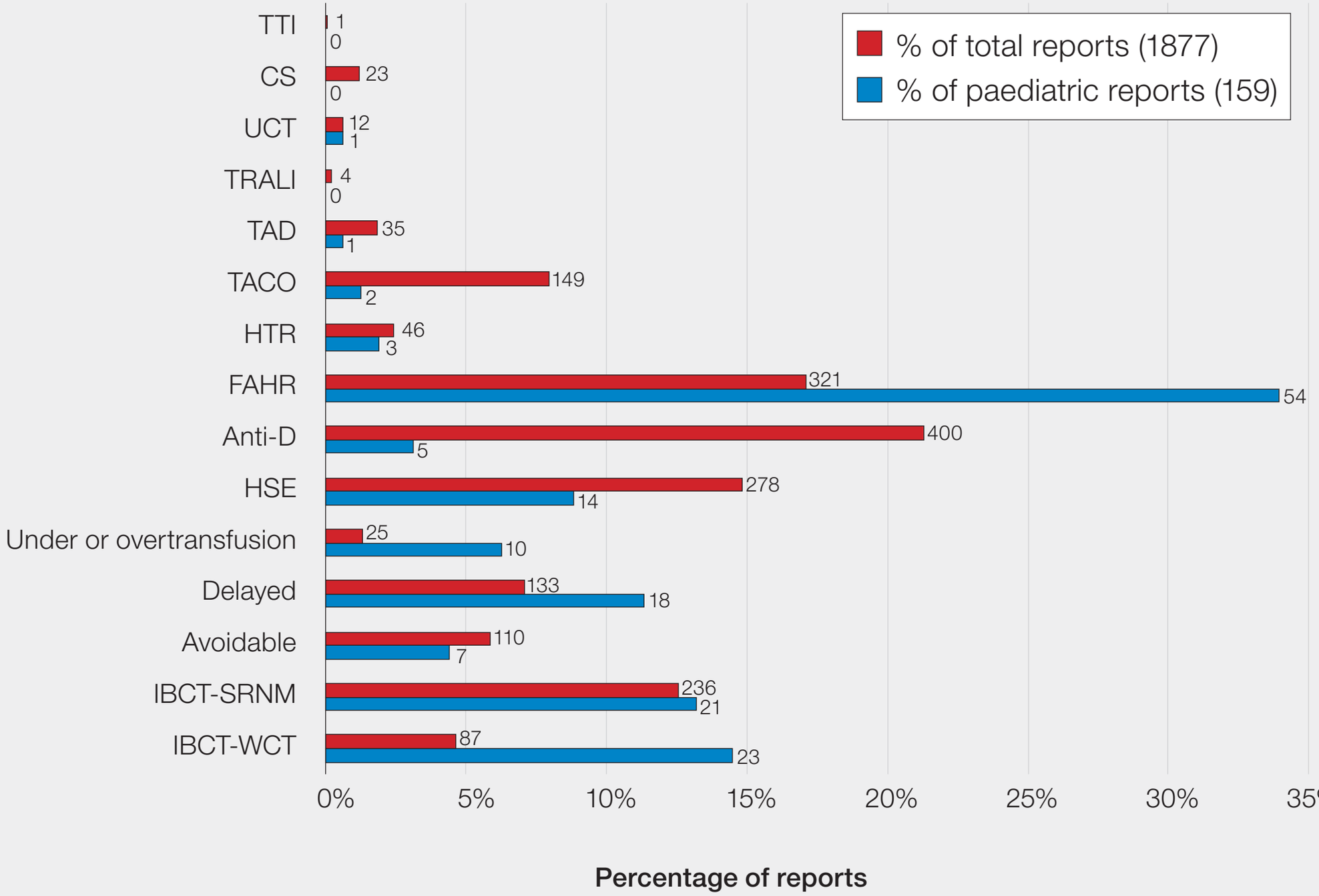


Figure 23.2: Summary of paediatric cases by category and age 2020 (n=159)



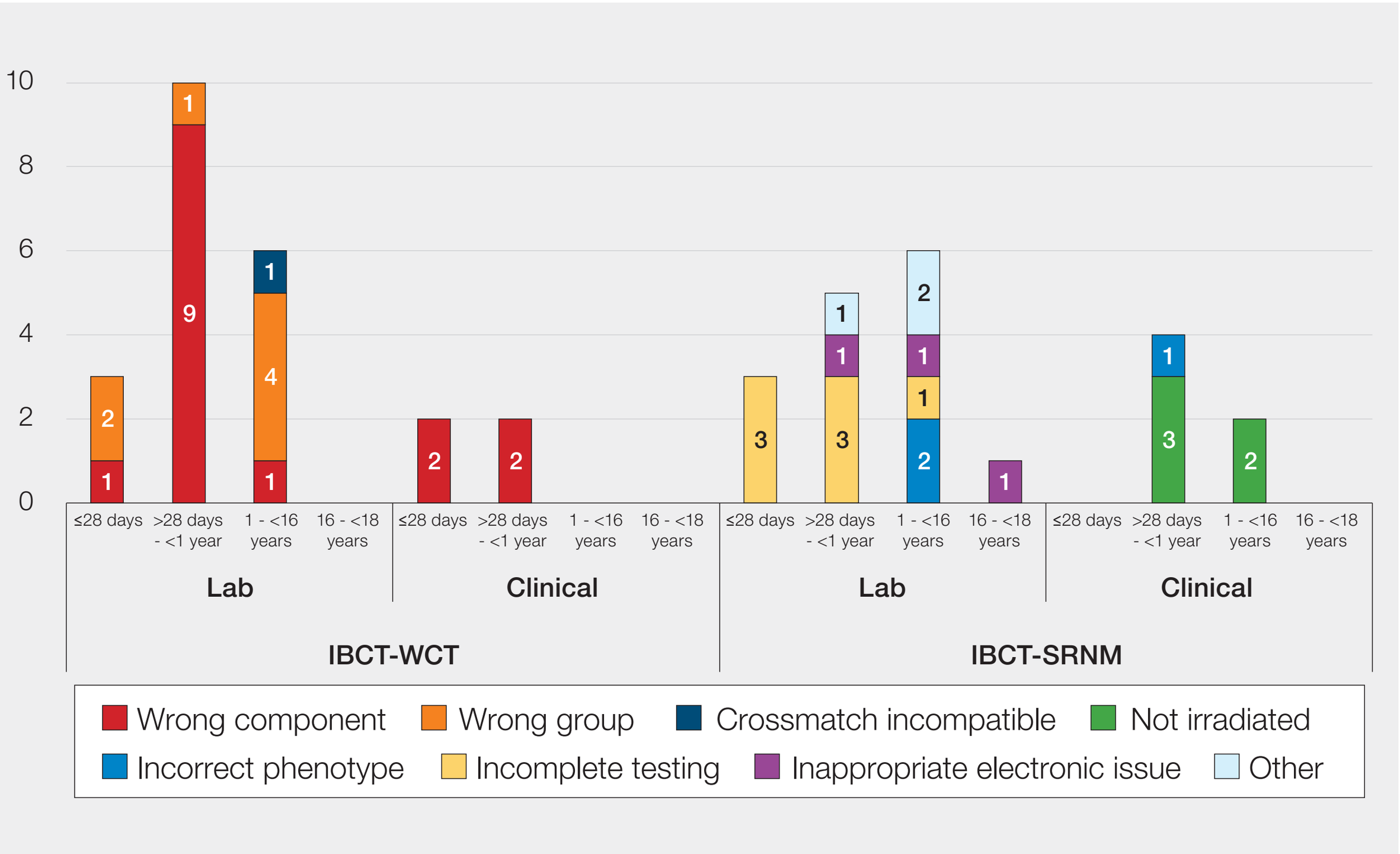
IBCT=incorrect blood component transfused; FAHR=febrile, allergic and hypotensive reactions; HSE=handling and storage errors; TACO=transfusion-associated circulatory overload; TTI=transfusion-transmitted infection; UCT=uncommon complications of transfusion

Figure 23.3: Percentages of paediatric and total reports in each category



TTI=transfusion-transmitted infection; UCT=uncommon 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 transfused

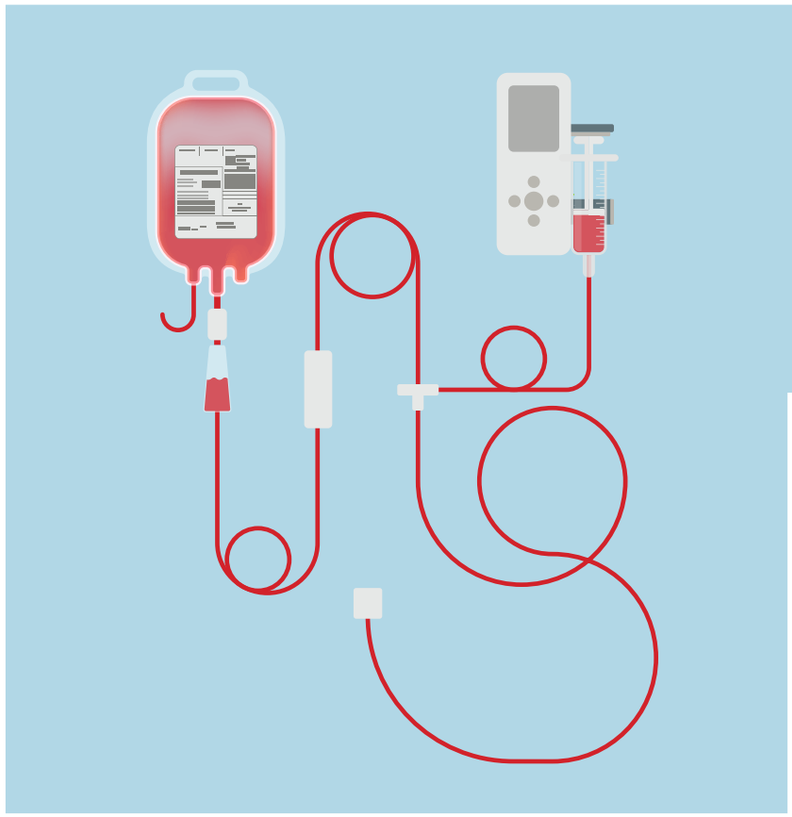
Figure 23.4: Breakdown of incorrect blood component transfused reports (n=44)



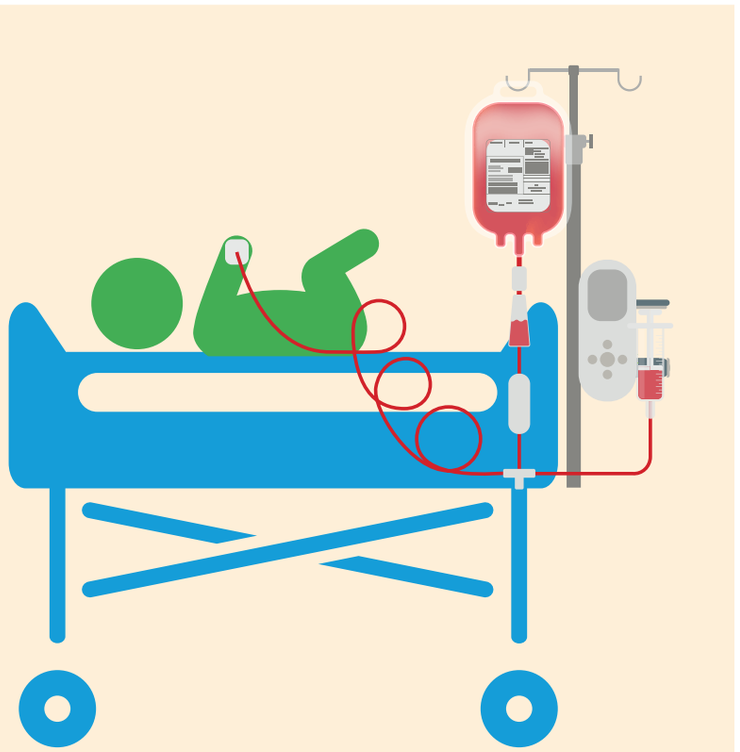
IBCT-WCT=incorrect blood component transfused-wrong component transfused; IBCT-SRNM=IBCT-specific requirements not met; MB=methylene blue-treated; SD=solvent-detergent treated

Note: Category 'other' includes invalid sample (n=1), K positive red cells to individual with childbearing potential (n=1), failure to provide washed platelets (n=1)

Figure 23.5 (a and b): Transfusion set up for neonates and infants



a: Neonatal transfusion giving set with syringe driver and 3-way tap



b: Infant receiving a red cell transfusion

Figure 23.6: Trend in paediatric FAHR reports 2011-2020

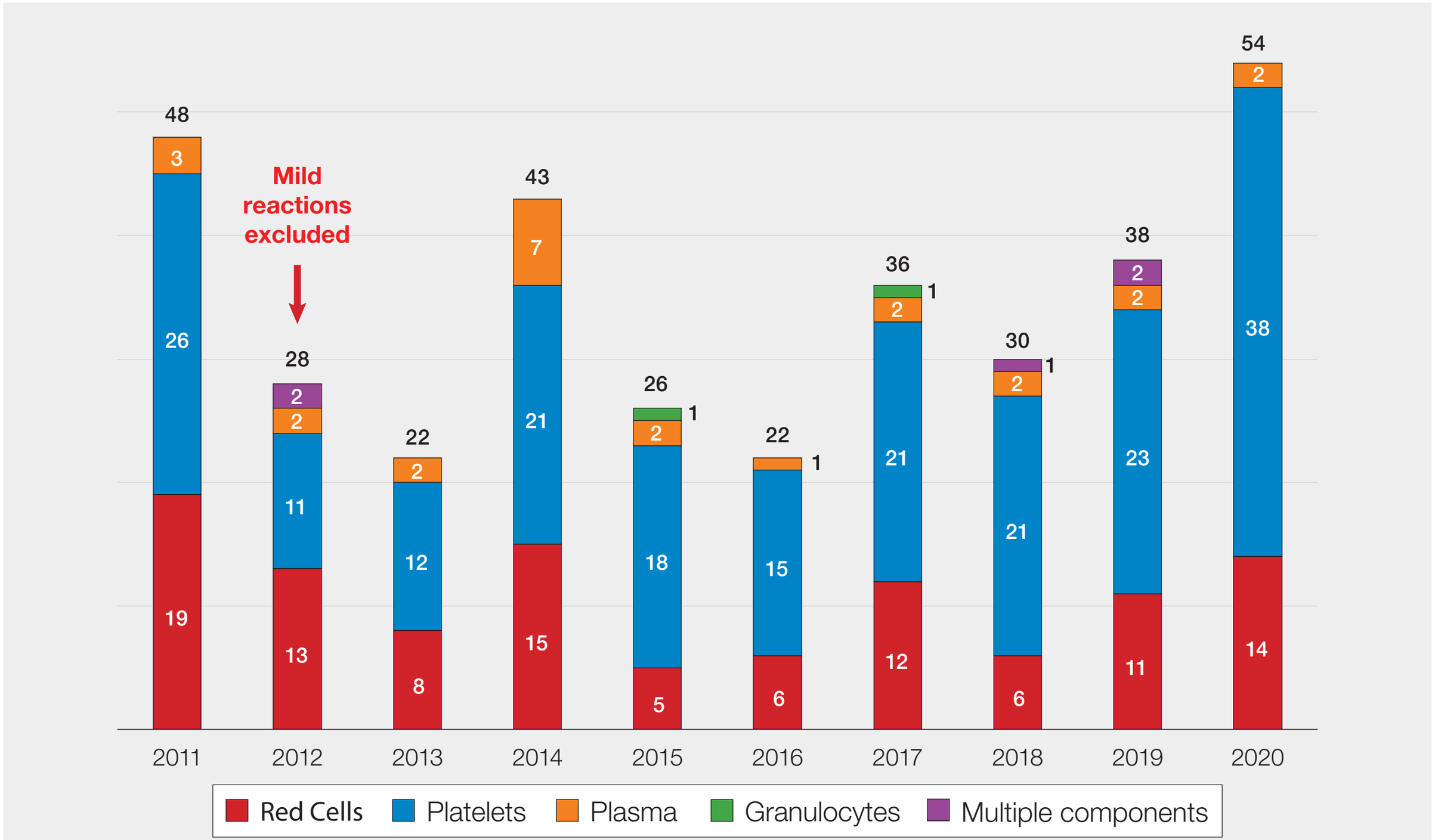
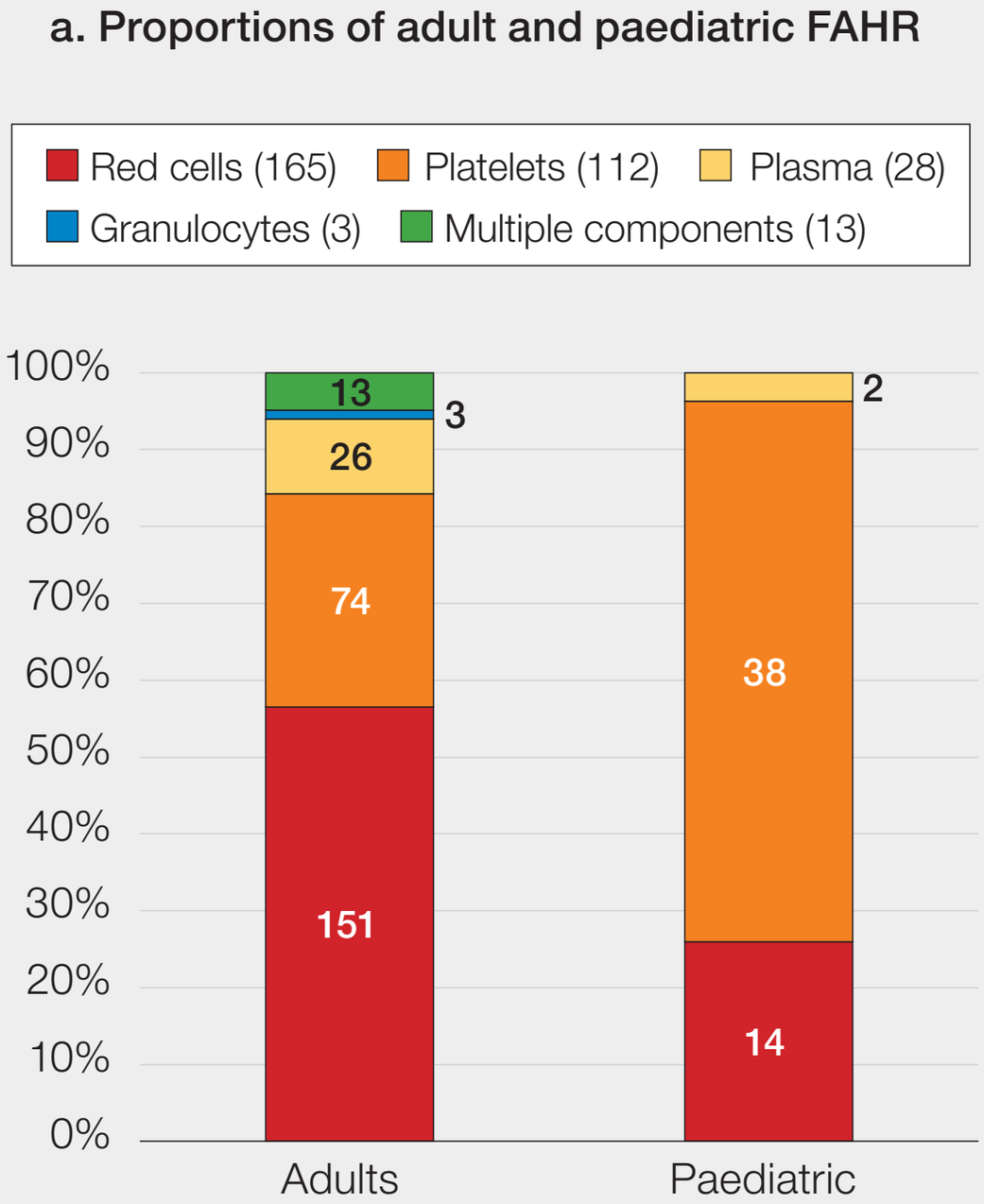


Figure 23.7 (a and b): Paediatric FAHR reports in 2020 n=54



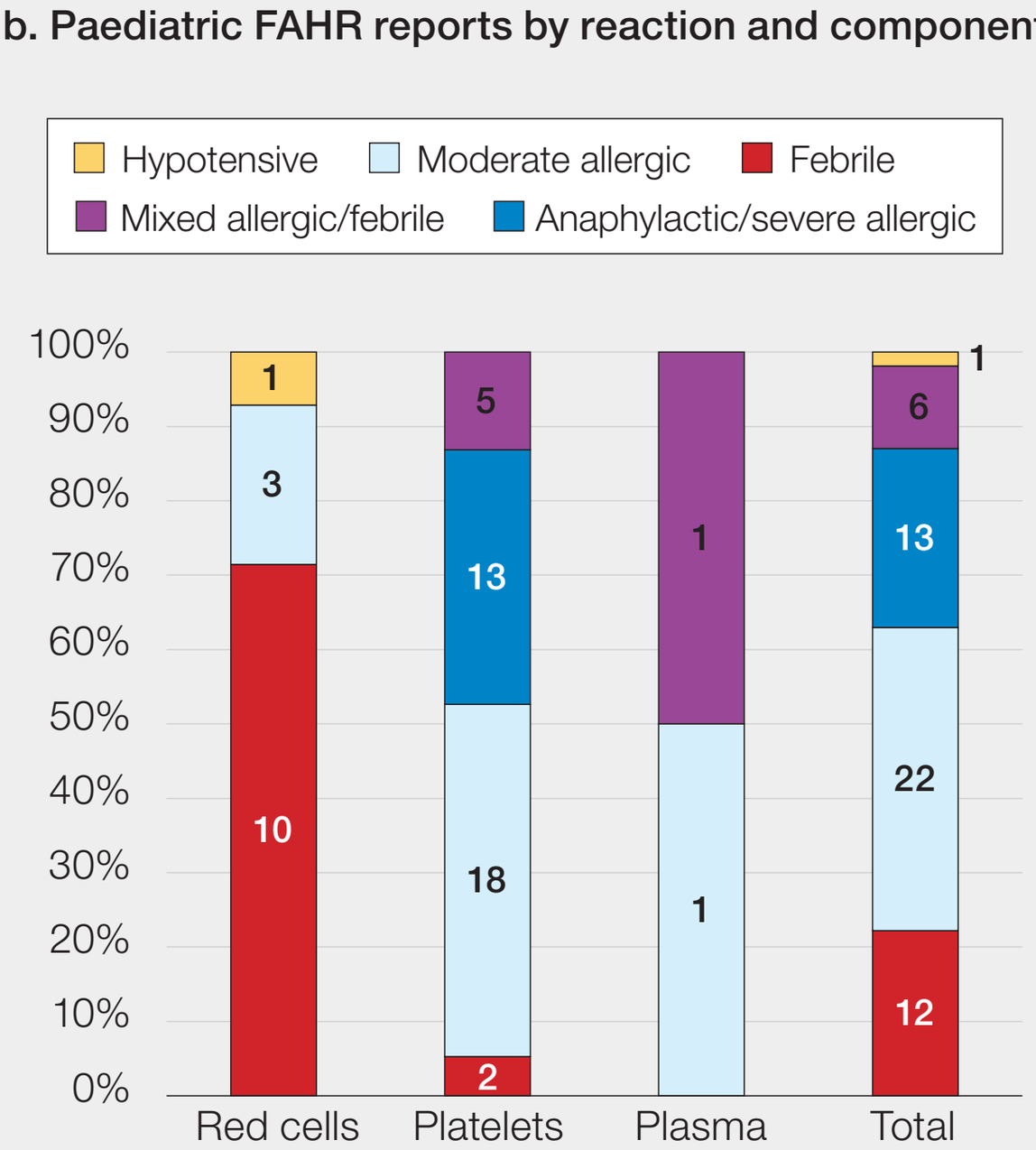
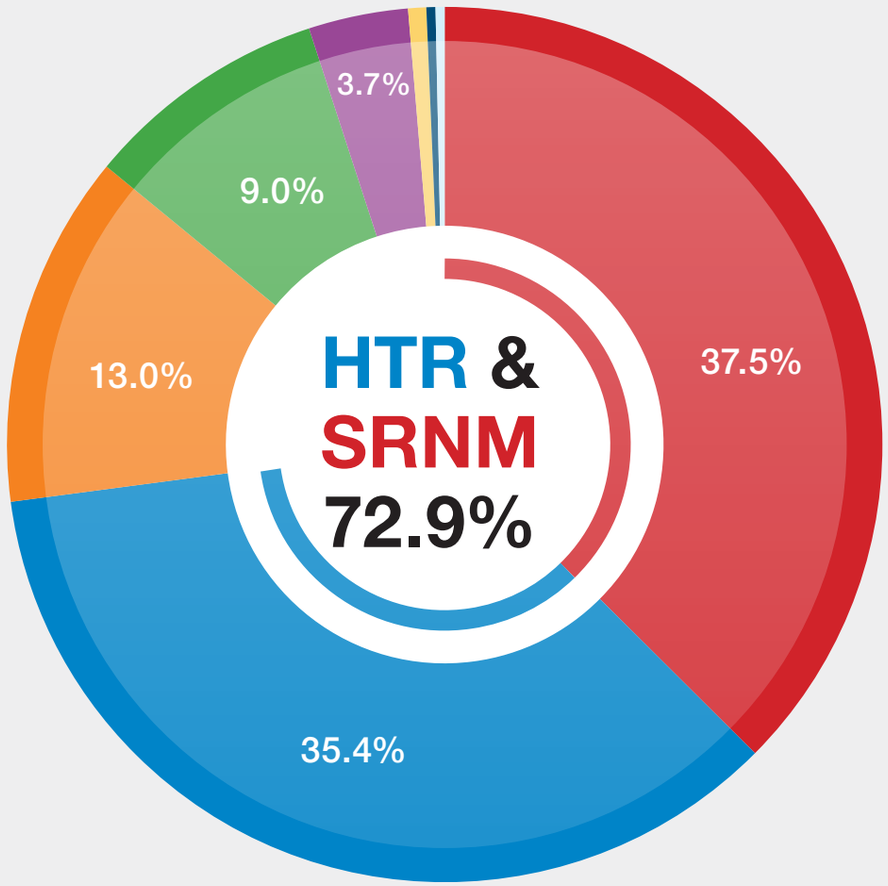


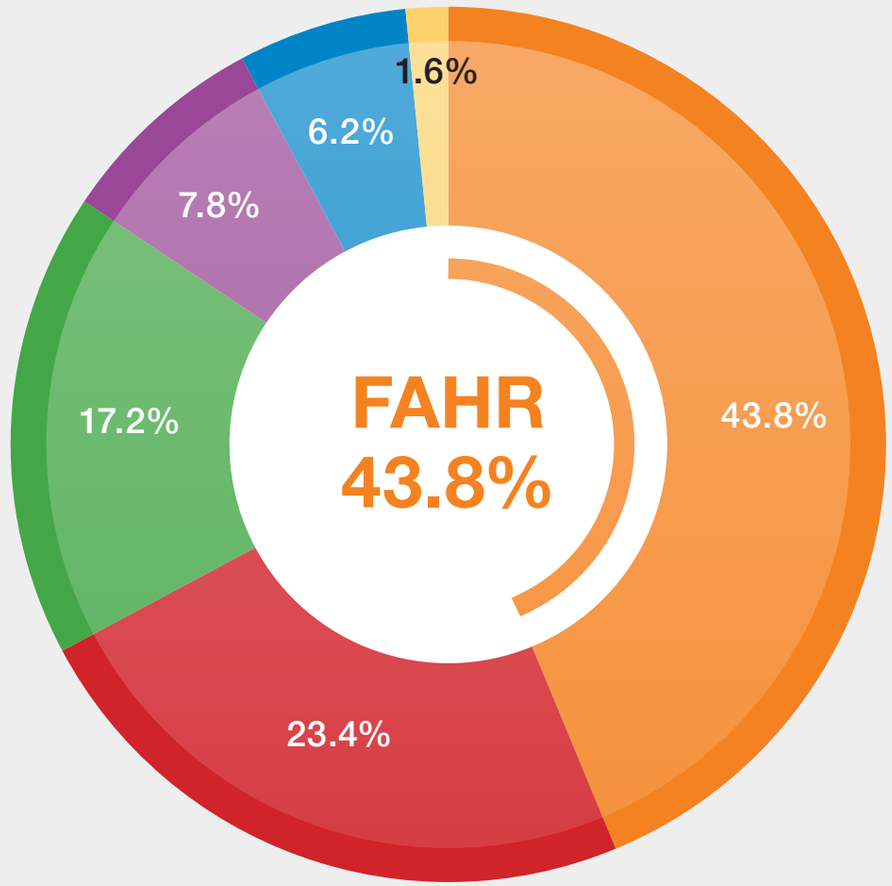
Figure 24.1: Cumulative data for adverse transfusion events in patients with haemoglobin disorders 2010 to 2020

a. Sickle cell disease n=299



112	IBCT-SRNM	11	IBCT-WCT
106	HTR	2	TACO
39	FAHR	1	TAD
27	ADU	1	TTI

b. Thalassaemia n=64



28	FAHR	5	IBCT-WCT
15	IBCT-SRNM	4	HTR
11	ADU	1	TACO

TTI=transfusion-transmitted infection; 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 transfused; ADU=avoidable, delayed and under/overtransfusion

Figure 25.1: Number of reports of anti-D immunisation in pregnancy by year, 2012-2020

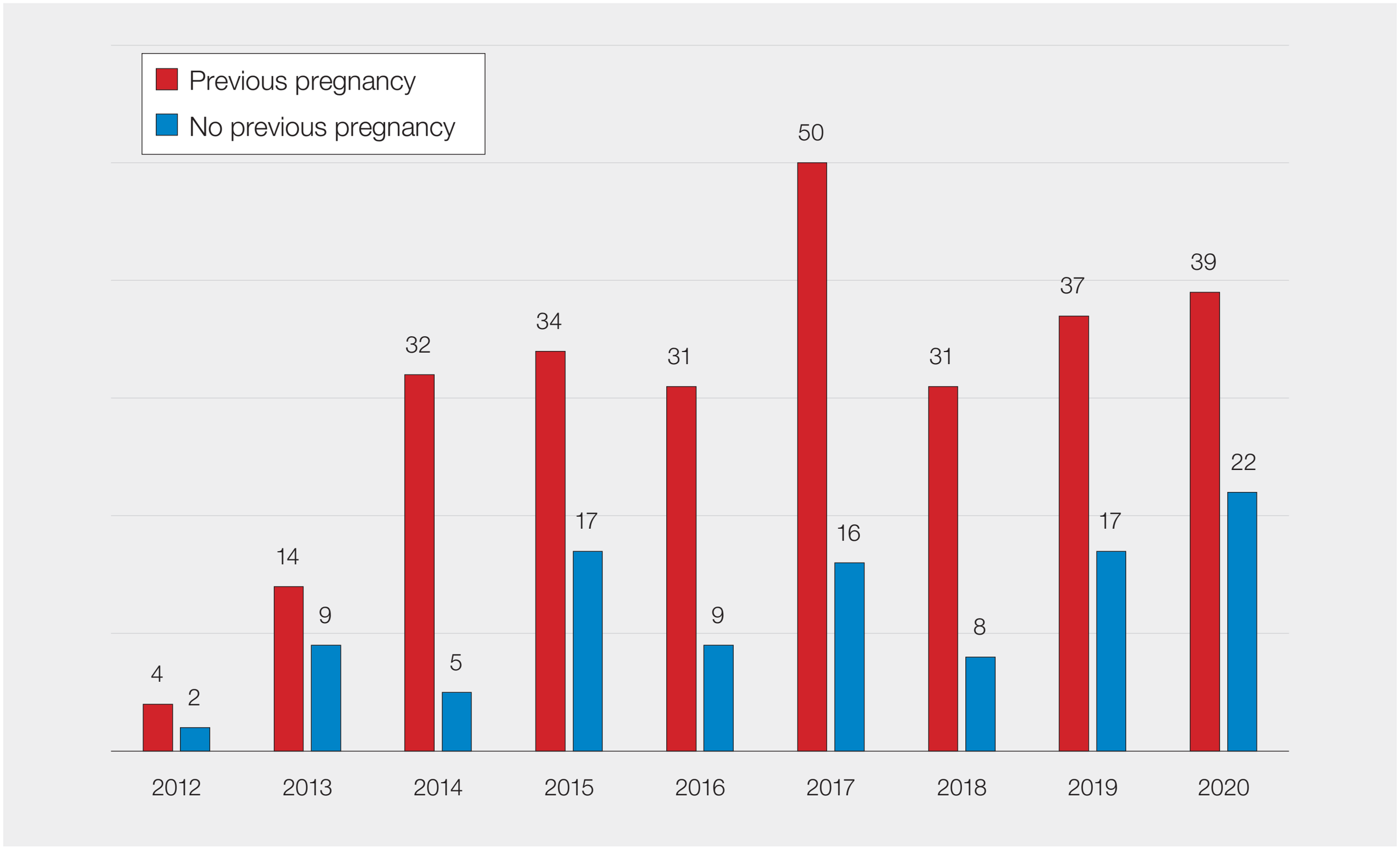
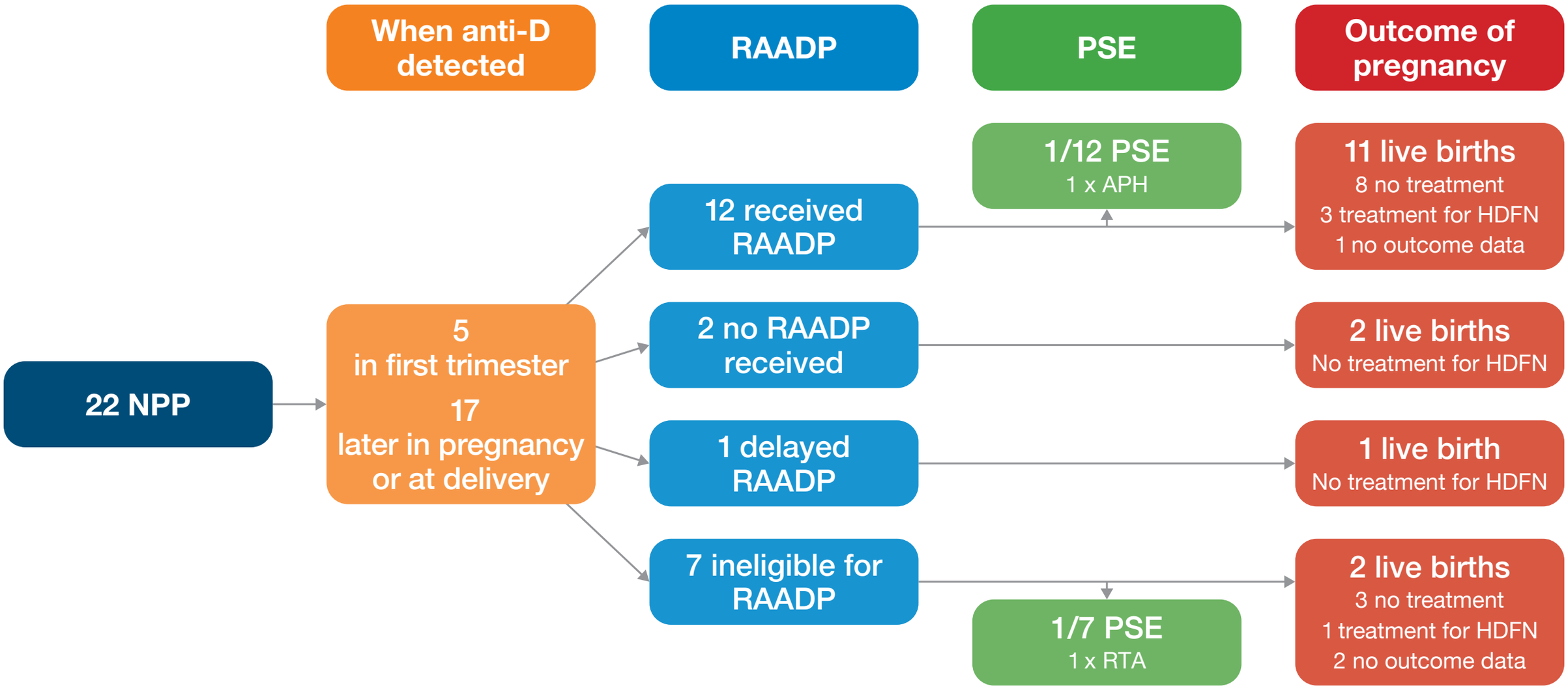
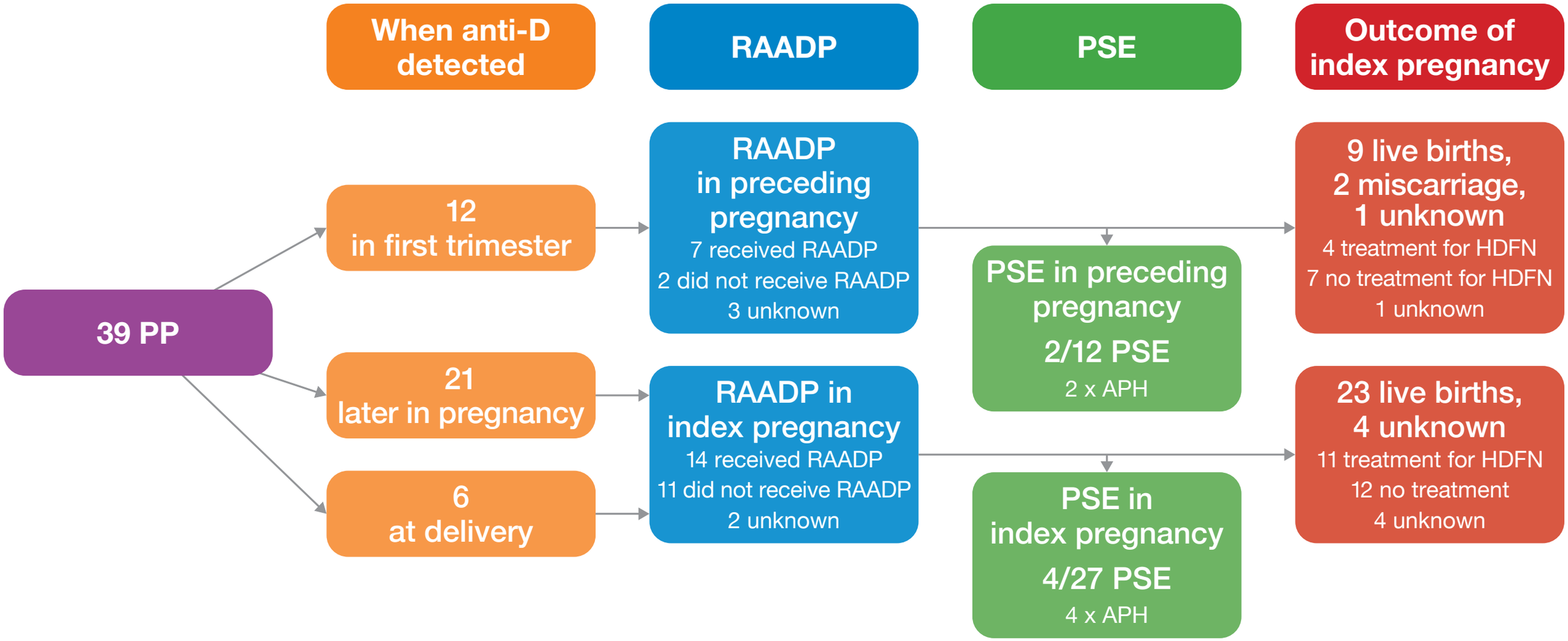


Figure 25.2: Summary of 2020 NPP data (n=22)



NPP = no previous pregnancy; RAADP = routine antenatal anti-D Ig prophylaxis; PSE = potentially sensitising event; APH = antepartum haemorrhage; RTA = road traffic accident; IUD = intrauterine death; HDFN = haemolytic disease of the fetus and newborn

Figure 25.3: Summary of 2020 PP data (n=39)



PP = previous pregnancy; RAADP = routine antenatal anti-D Ig prophylaxis; PSE = potentially sensitising event; APH = antepartum haemorrhage; HDFN = haemolytic disease of the fetus and newborn

Figure 26.1: Submitted confirmation reports 2011-2020

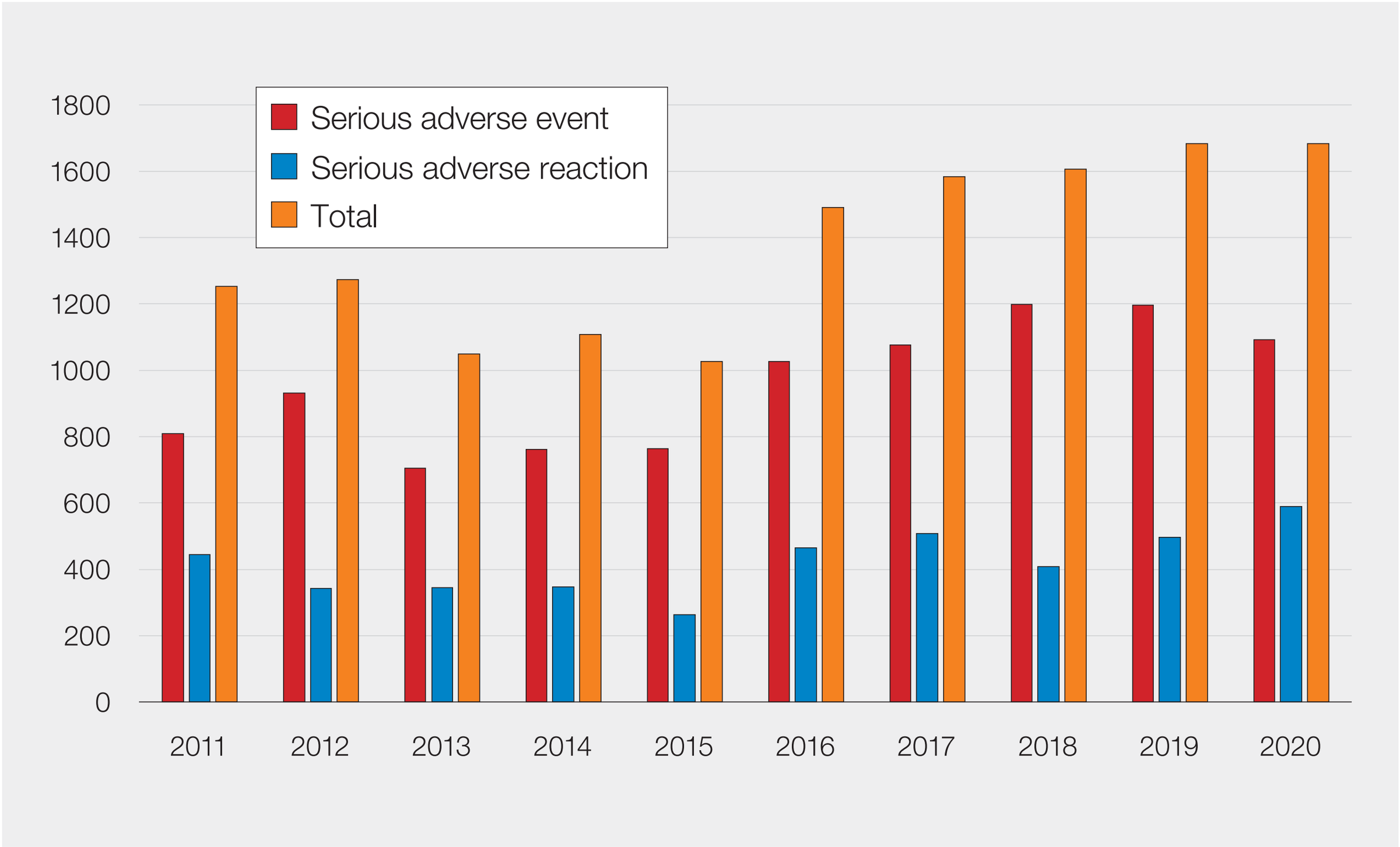


Figure 26.2 Comparison of SAE/SAR reports received by month 2019 and 2020

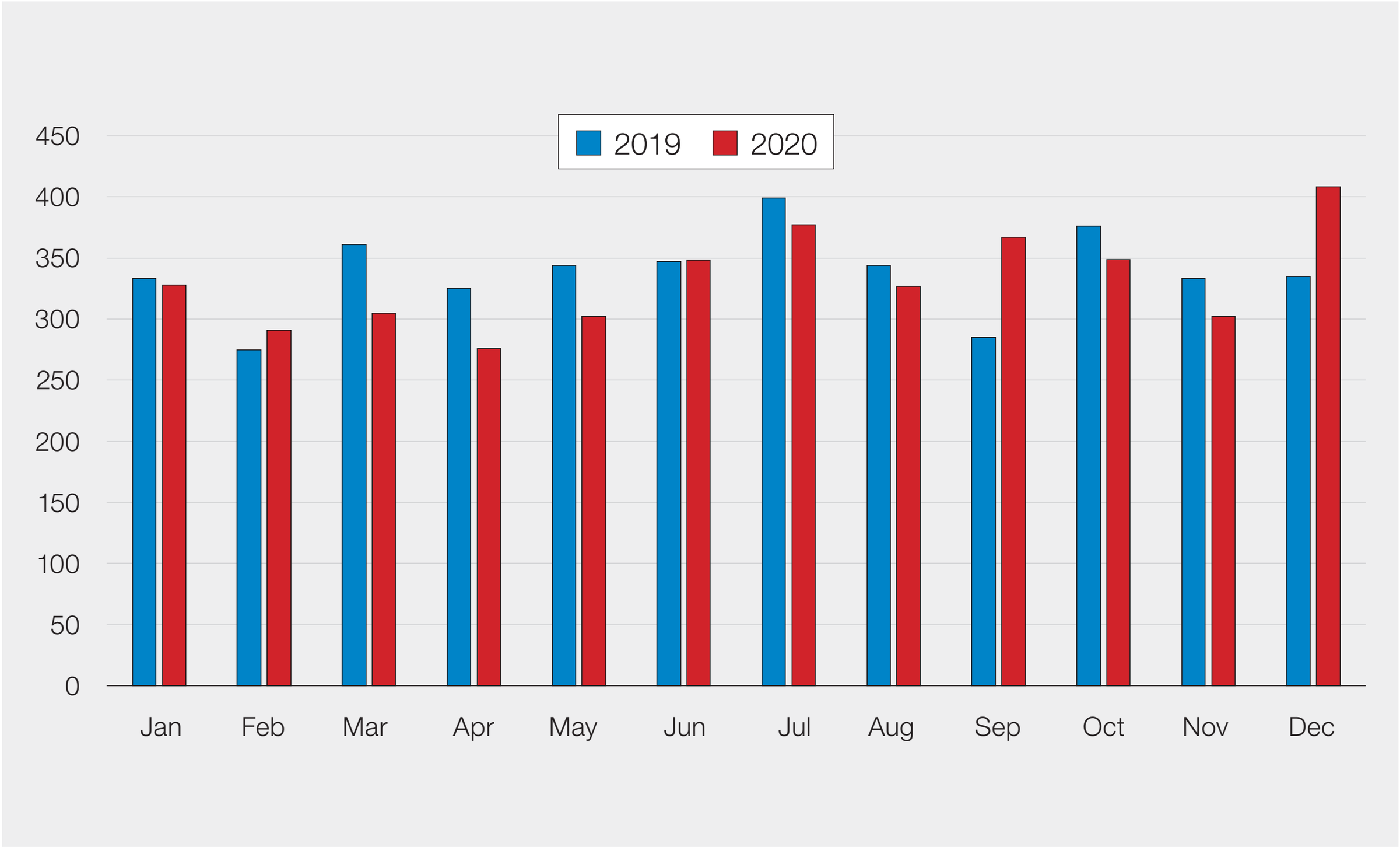


Figure 26.3: Incorrect storage of component by Specification 2019 and 2020

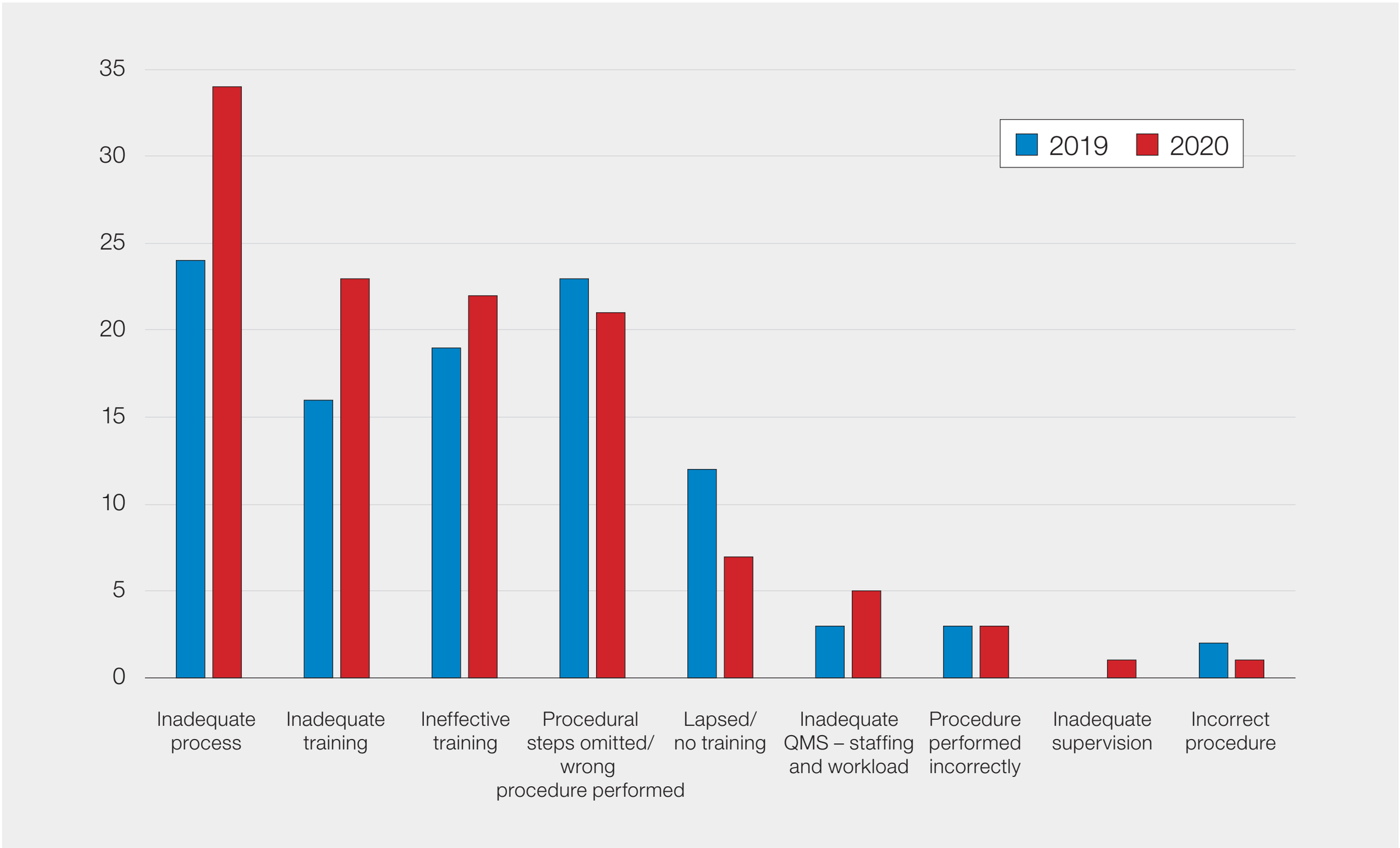
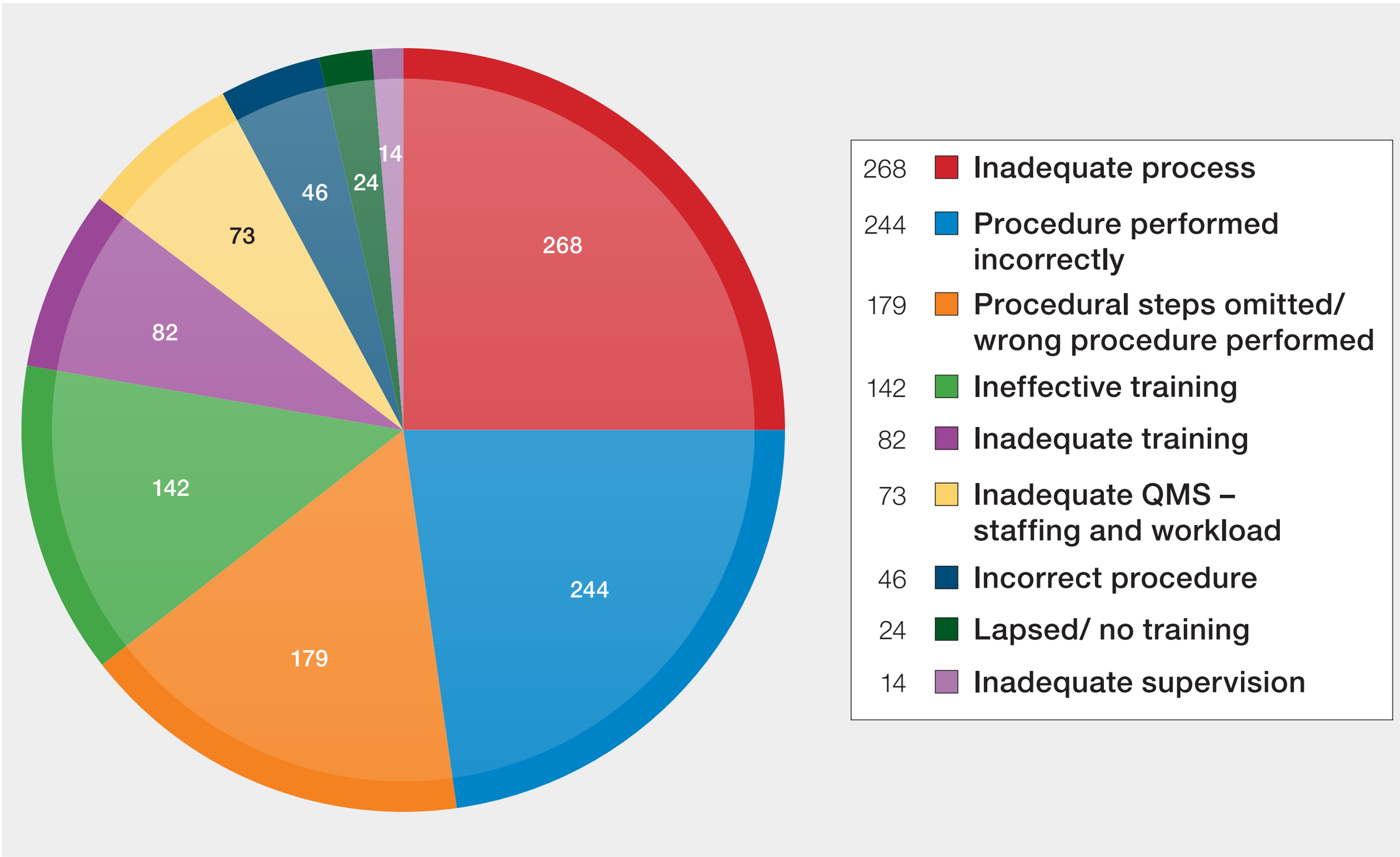
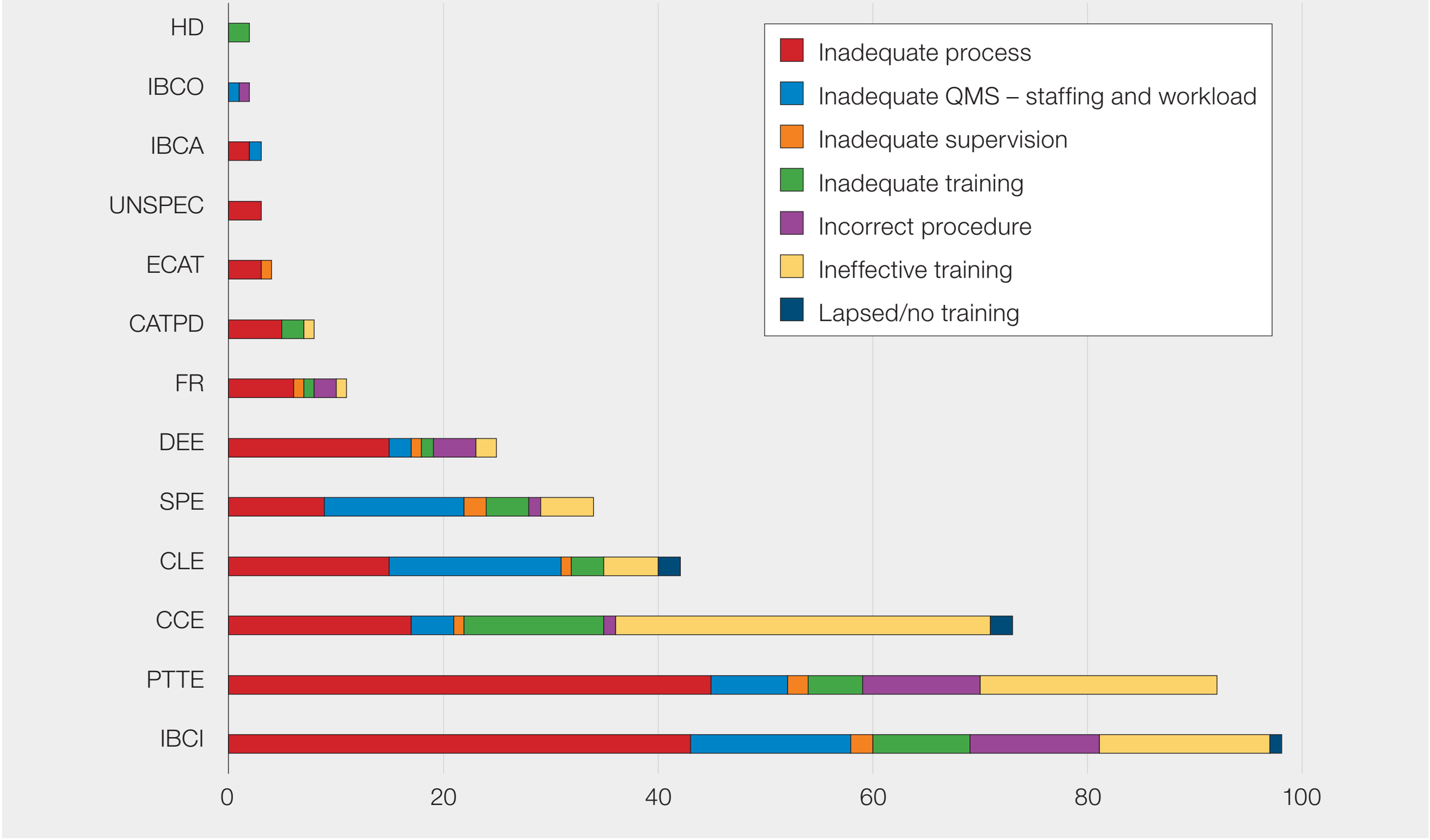


Figure 26.4: Human error sub-category



QMS = quality management system

Figure 26.5: Other sub-category and root cause for all SAE other than procedural steps omitted/wrong procedure performed and procedure performed incorrectly



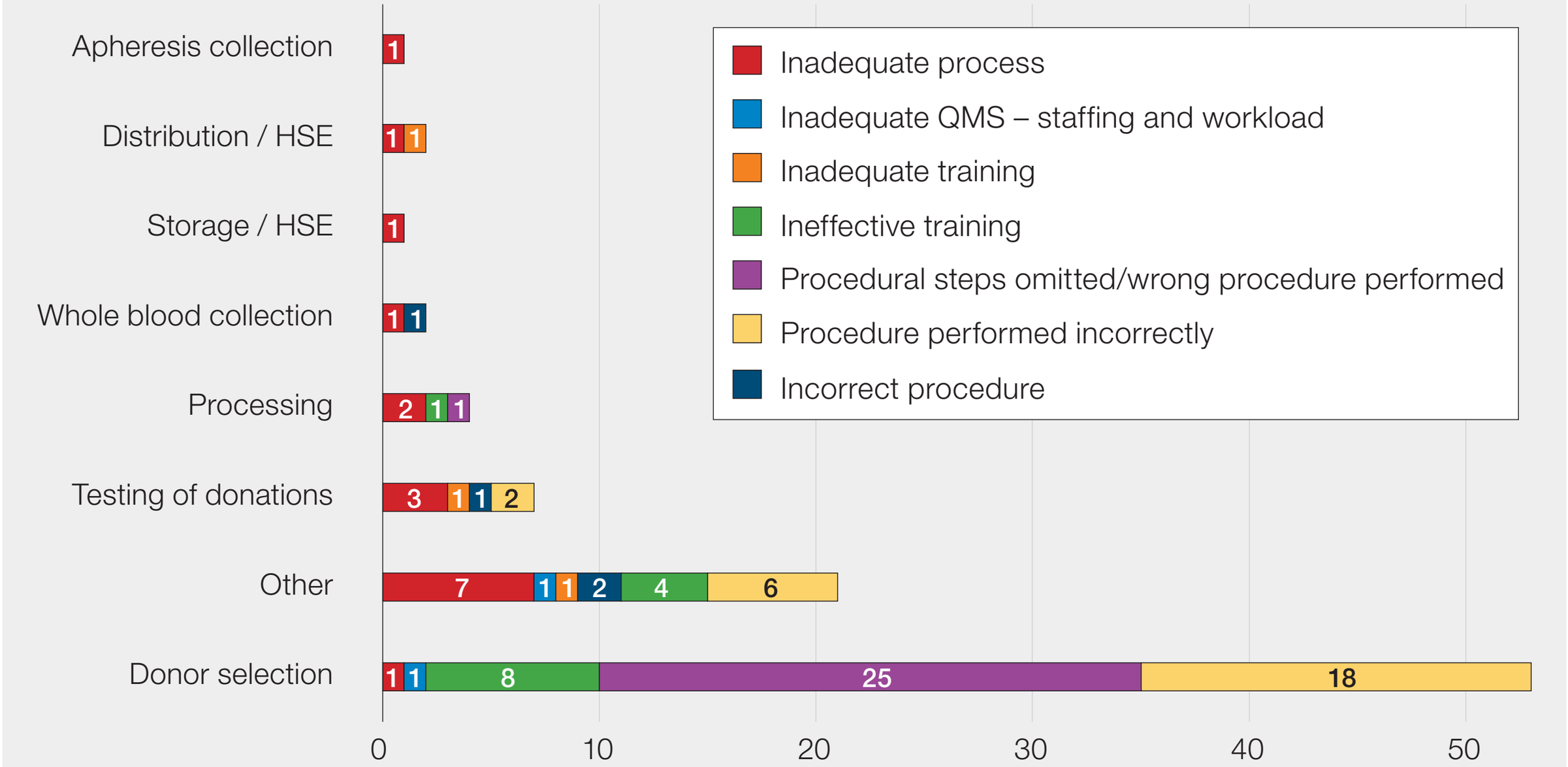
HD = handling damage; IBCO = incorrect blood component ordered; IBCA = incorrect blood component accepted; UNSPEC = unspecified; ECAT = expired component available for transfusion; CATPD; component available for transfusion past de-reservation; FR = failed recall; DEE = data entry error; SPE = sample processing error; CLE = component labelling error; CCE = component collection error; PTTE = pre-transfusion testing error; IBCI = incorrect blood component issued

Figure 26.6: Example of a new human error sub-category to demonstrate a system error

Notification

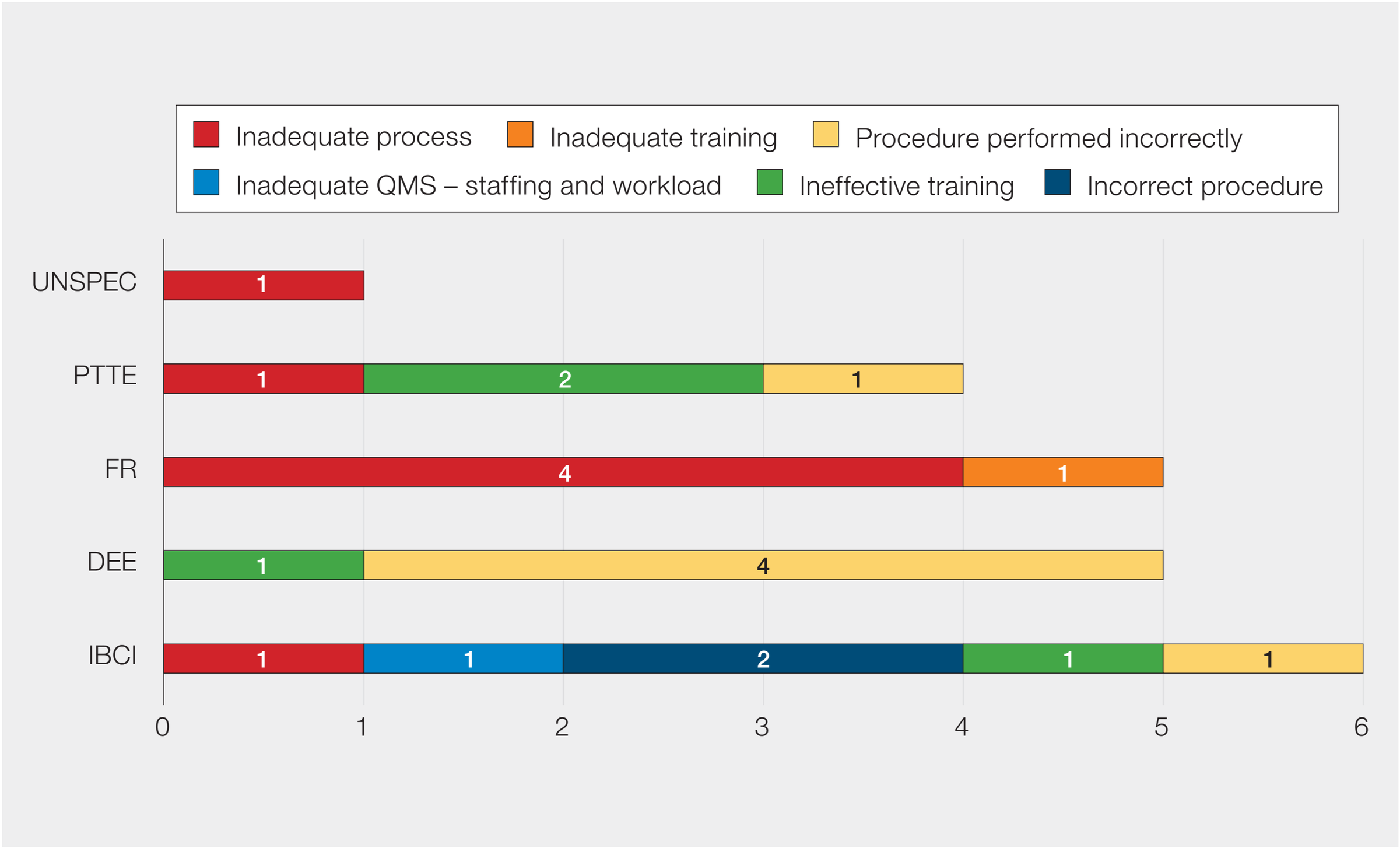
Date of event:	15 Mar 2021
Event involving:	Other
If other, please state here:	PTTE - Pre-transfusion testing error
Specification:	System error / Inadequate process
If other, please state here:	
Implicated Component:	Red blood cells
Blood component transfused:	No

Figure 26.7: Blood establishment SAE event category by specification



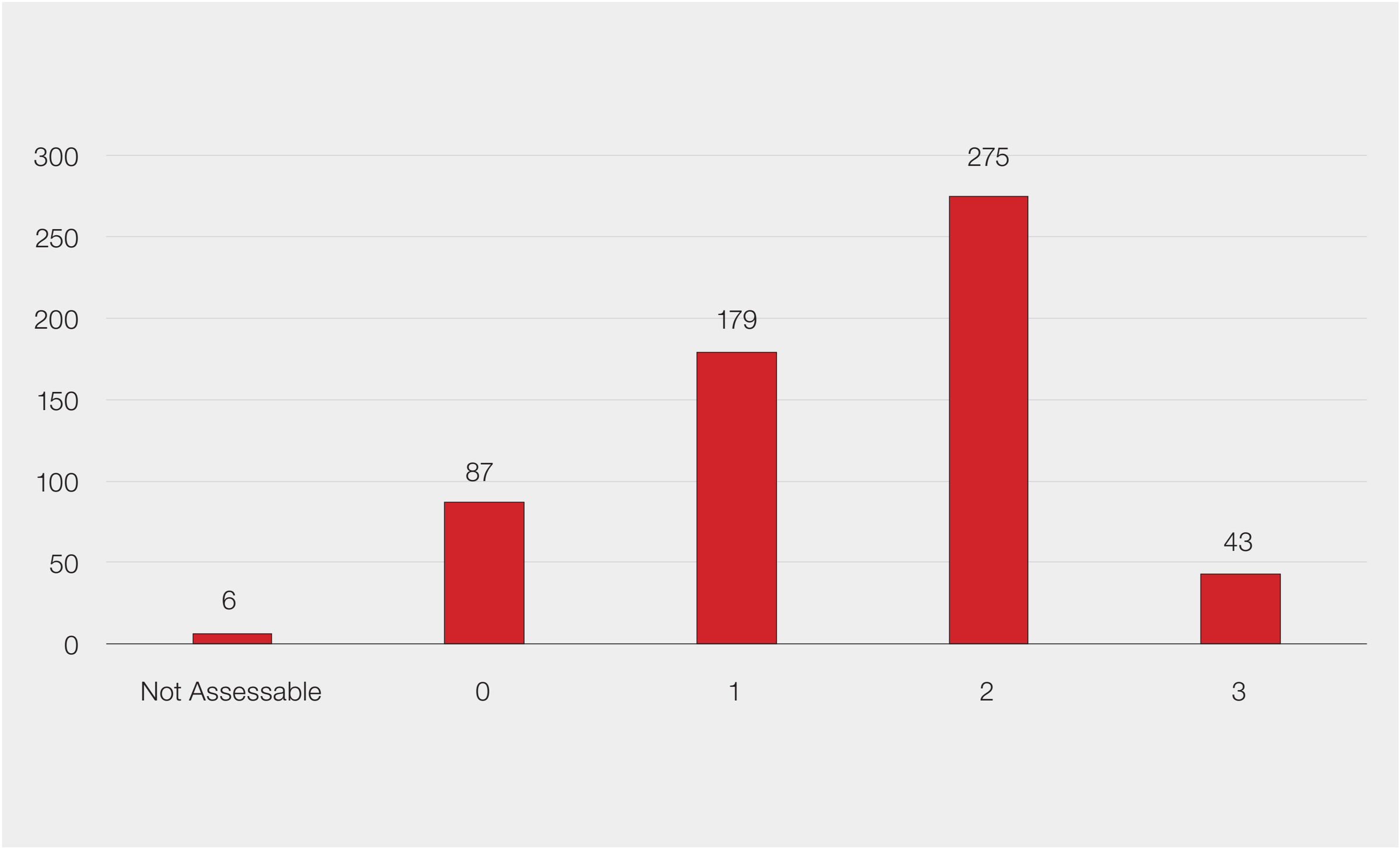
QMS = quality management system; HSE = handling and storage errors

Figure 26.8: BE reports in “Other” category



QMS = quality management system; UNSPEC = unspecified; PTTE = pre-transfusion testing error; FR = failed recall; DEE = data entry error; IBCI = incorrect blood component issued

Figure 26.9: SAR reports, by imputability, reported to SABRE in 2020



To improve patient safety, a combined approach using both Safety-I and Safety-II principles is essential

- Respond when something happens or is categorised as an unacceptable risk
- As few things as possible go wrong
- Humans seen as liability or hazard
- Investigation purpose: identify causes and contributory factors

- Continuously trying to anticipate developments and events
- As many things as possible go right
- Humans seen as resource for system flexibility and resilience
- Investigation purpose: understand how things usually go right to explain how things occasionally go wrong