# FIGURES FROM THE ANNUAL SHOT REPORT 2024

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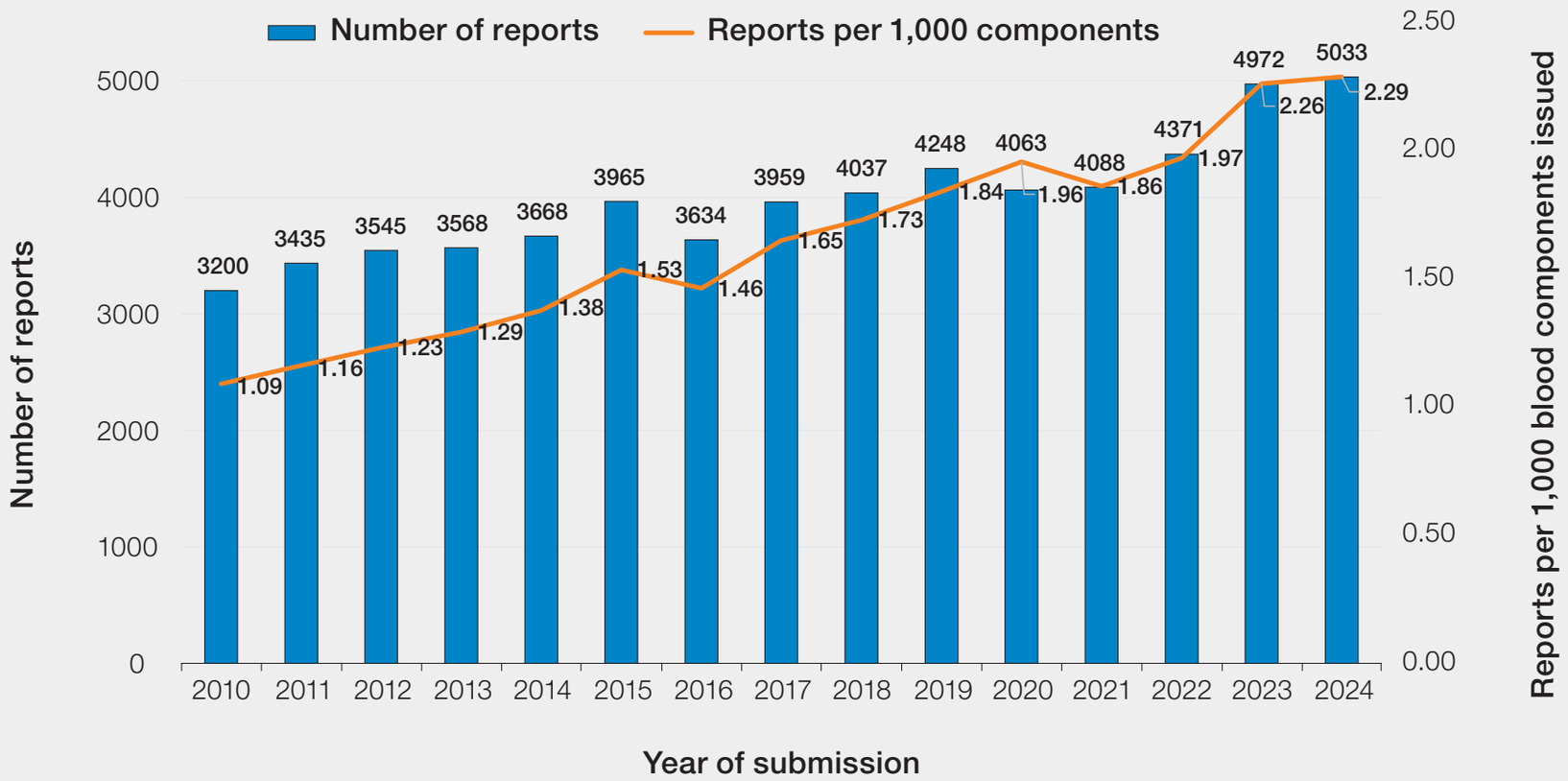
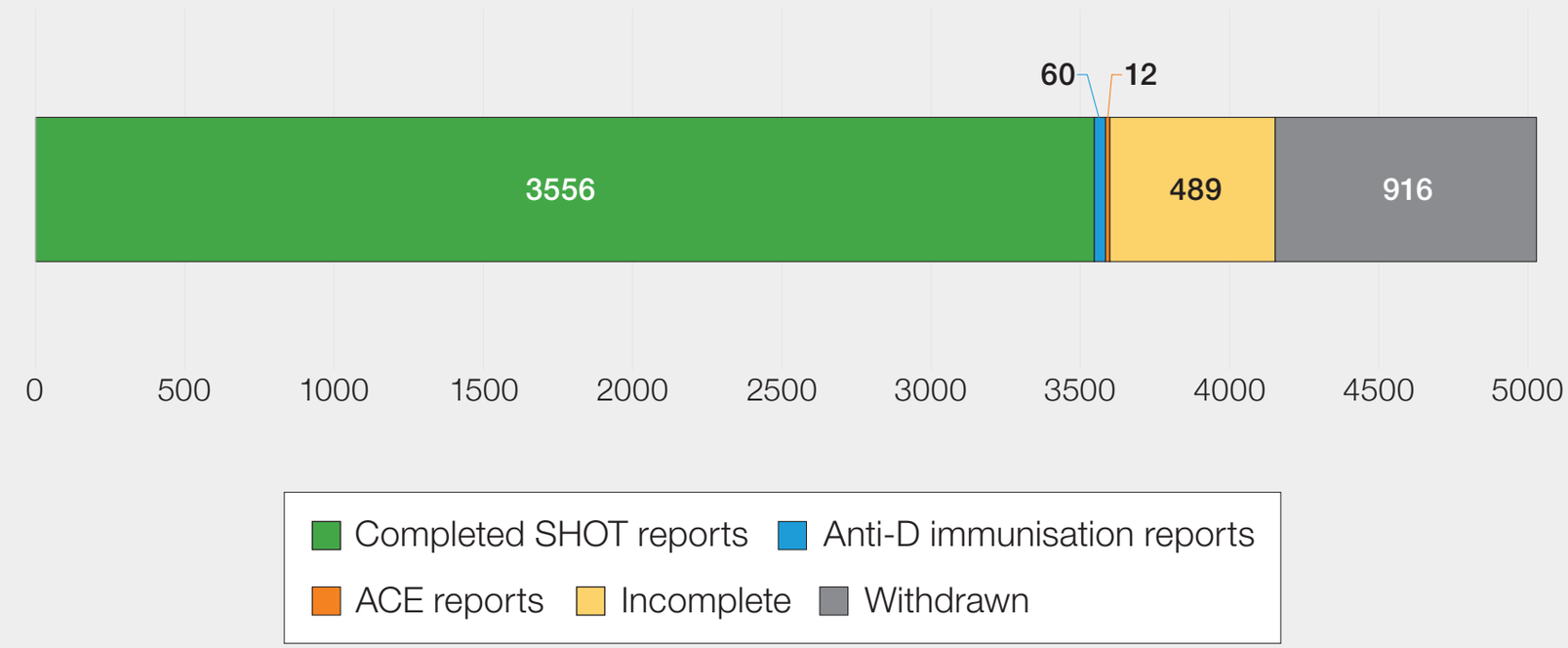
SHOT Serious Hazards of Transfusion

## Figure 2.1: Haemovigilance reports submitted by year with reports per 1,000 blood components issued 2010-2024

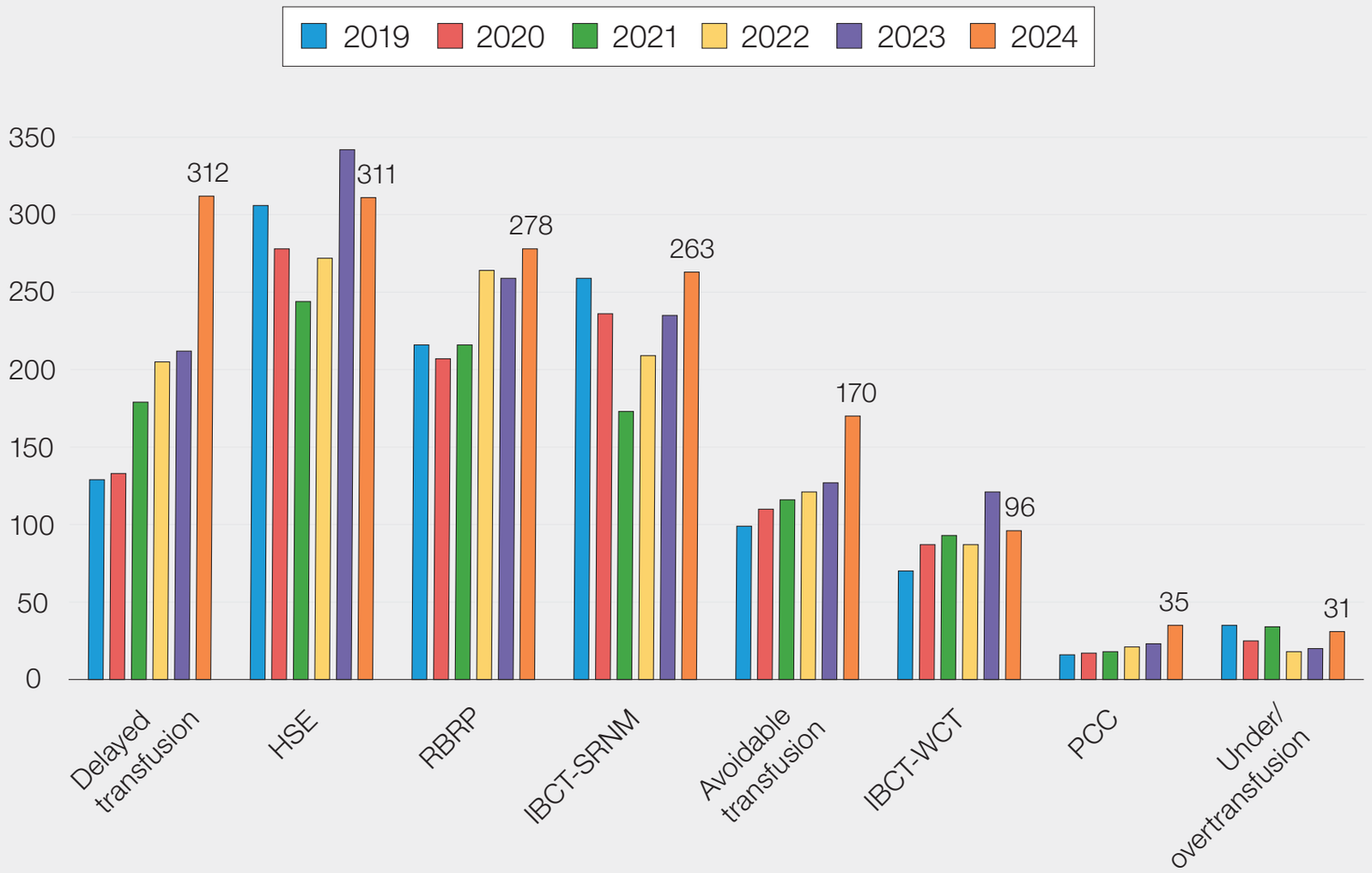


## Figure 2.2: The status of reports submitted to SHOT in 2024 (n=5033)



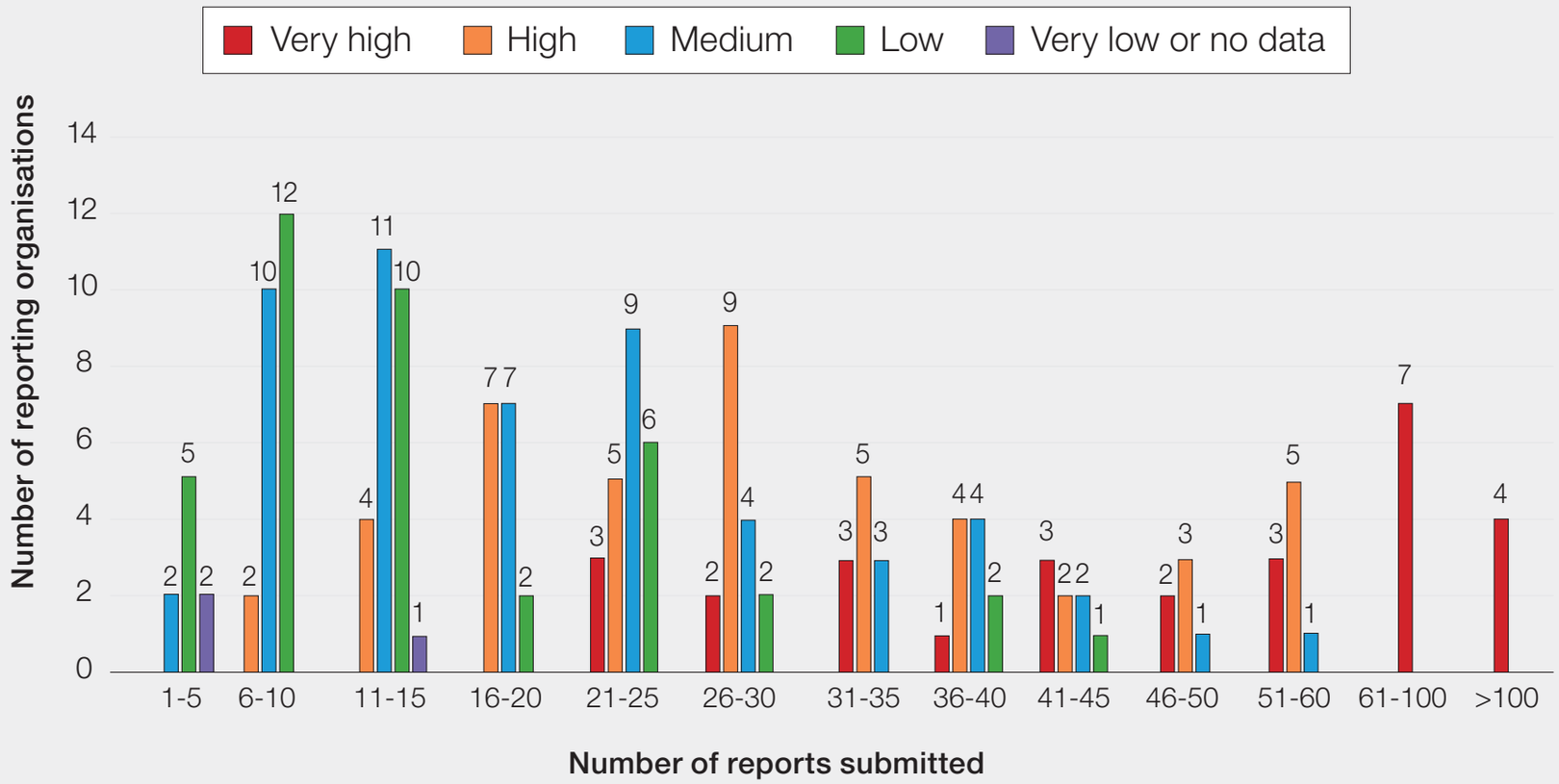

*ACE=acknowledging continuing excellence. Note: One case submitted and completed in 2024 was a possible transfusion-transmitted infection (TTI) from 2023. This has not been included in this year's Annual SHOT Report numbers, but was discussed in the 2023 Annual SHOT Report (Narayan, et al., 2024)*

## Figure 2.3: Number of reports by SHOT error category, 2019 to 2024

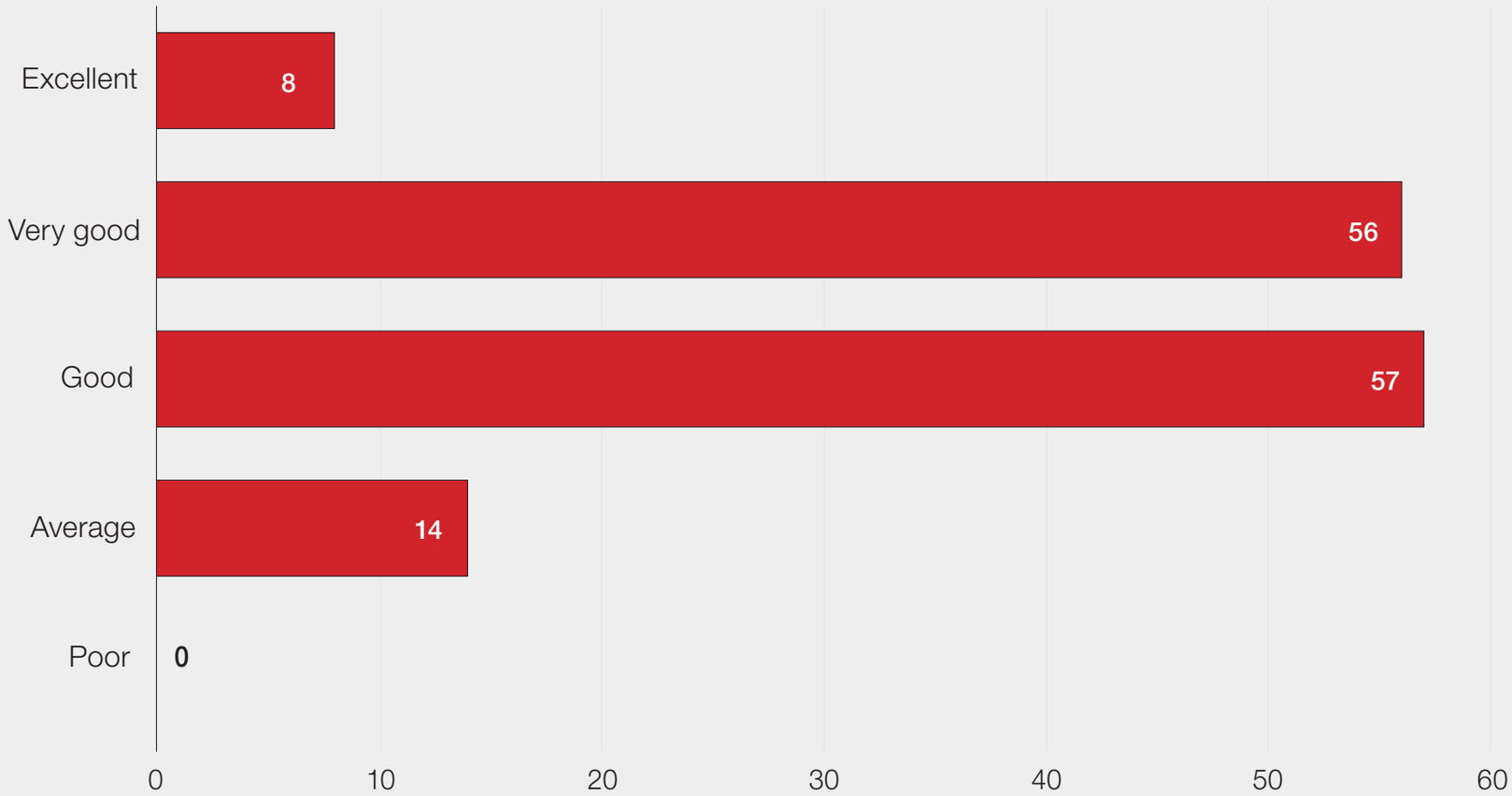



*HSE=handling and storage errors; RBRP=right blood right patient; IBCT-SRNM=incorrect blood component transfused-specific requirements not met; IBCT-WCT=IBCT-wrong component transfused; PCC=prothrombin complex concentrates*

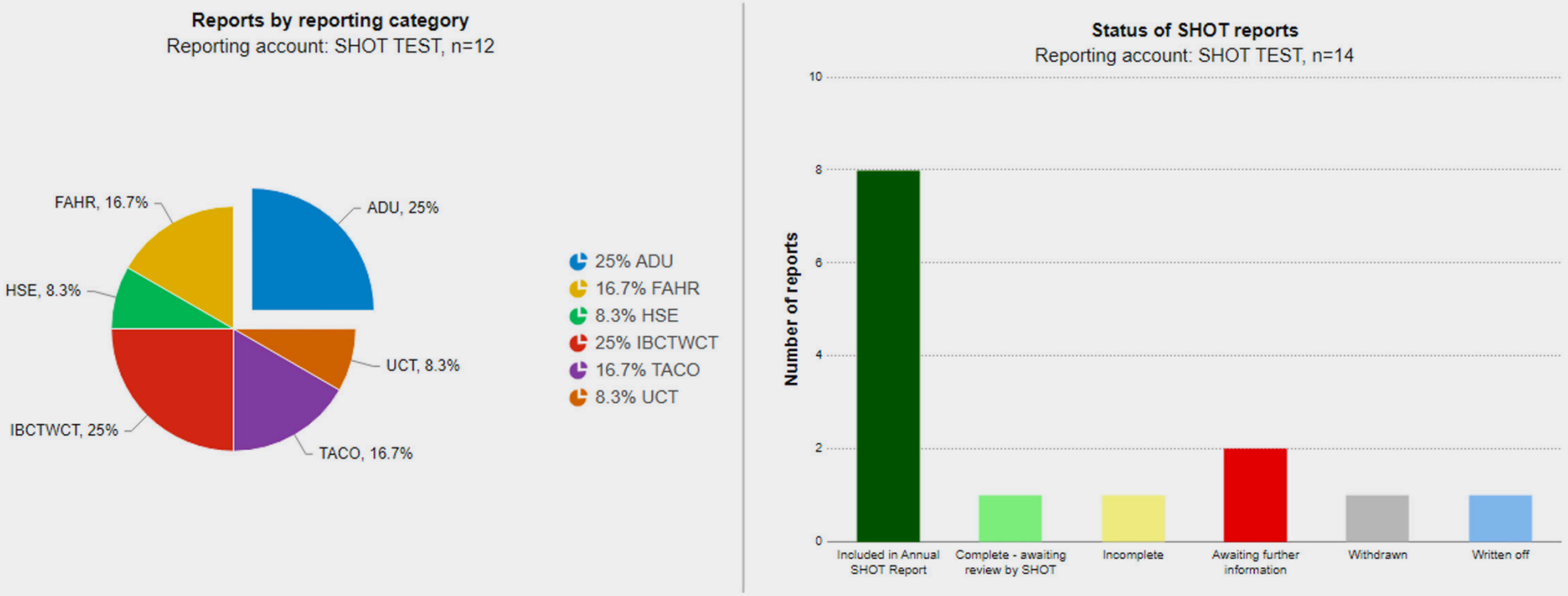
## Figure 2.4: Number of reports by NHS reporting organisation and component usage level in 2024



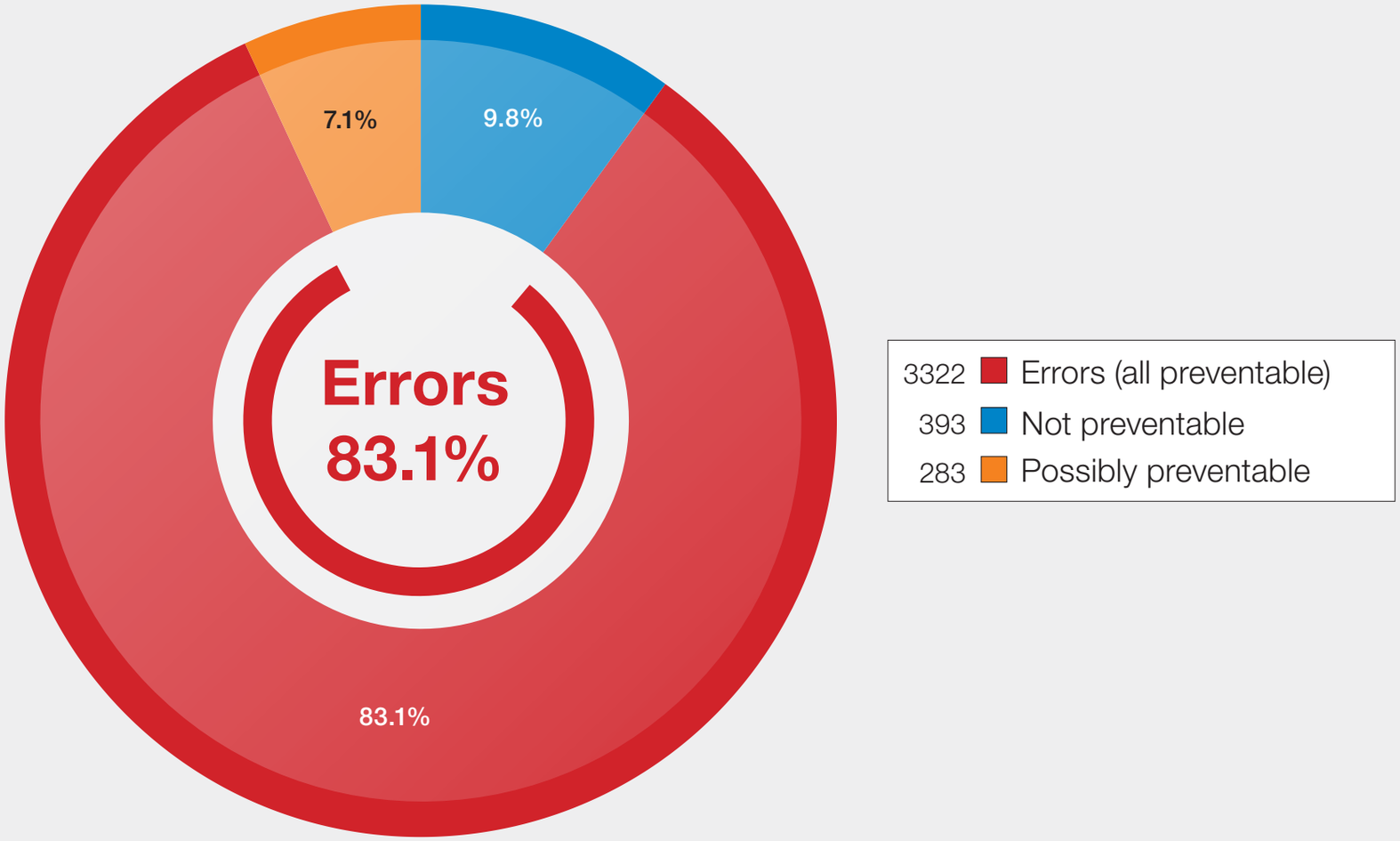
## Figure 2.5: Survey responses for ease of use of the new SHOT database user interface in July 2024



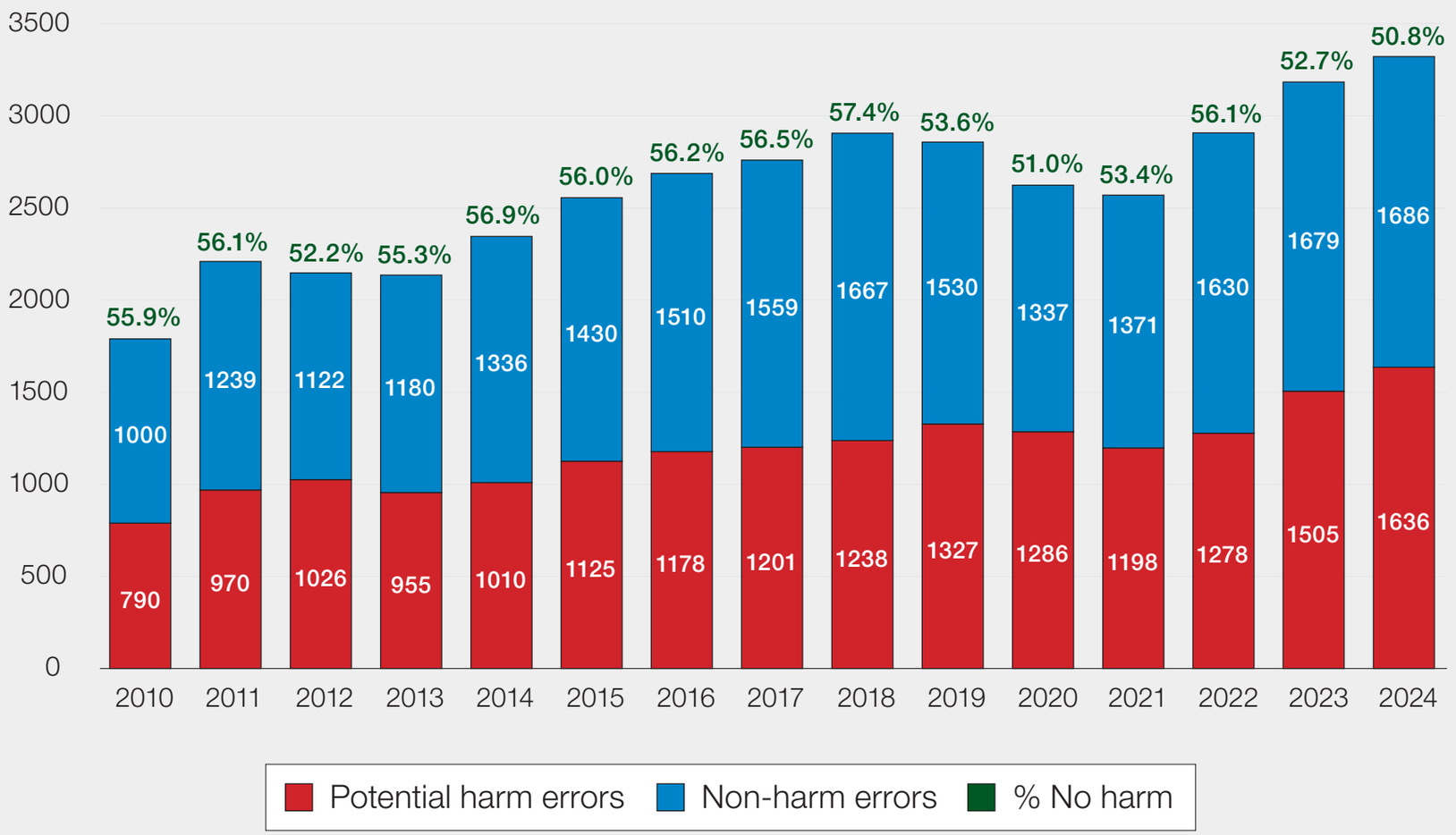
## Figure 2.6: Example graphs from the SHOT dashboard



## Figure 3.1: Errors account for most reports in 2024 (n=3322/3998)

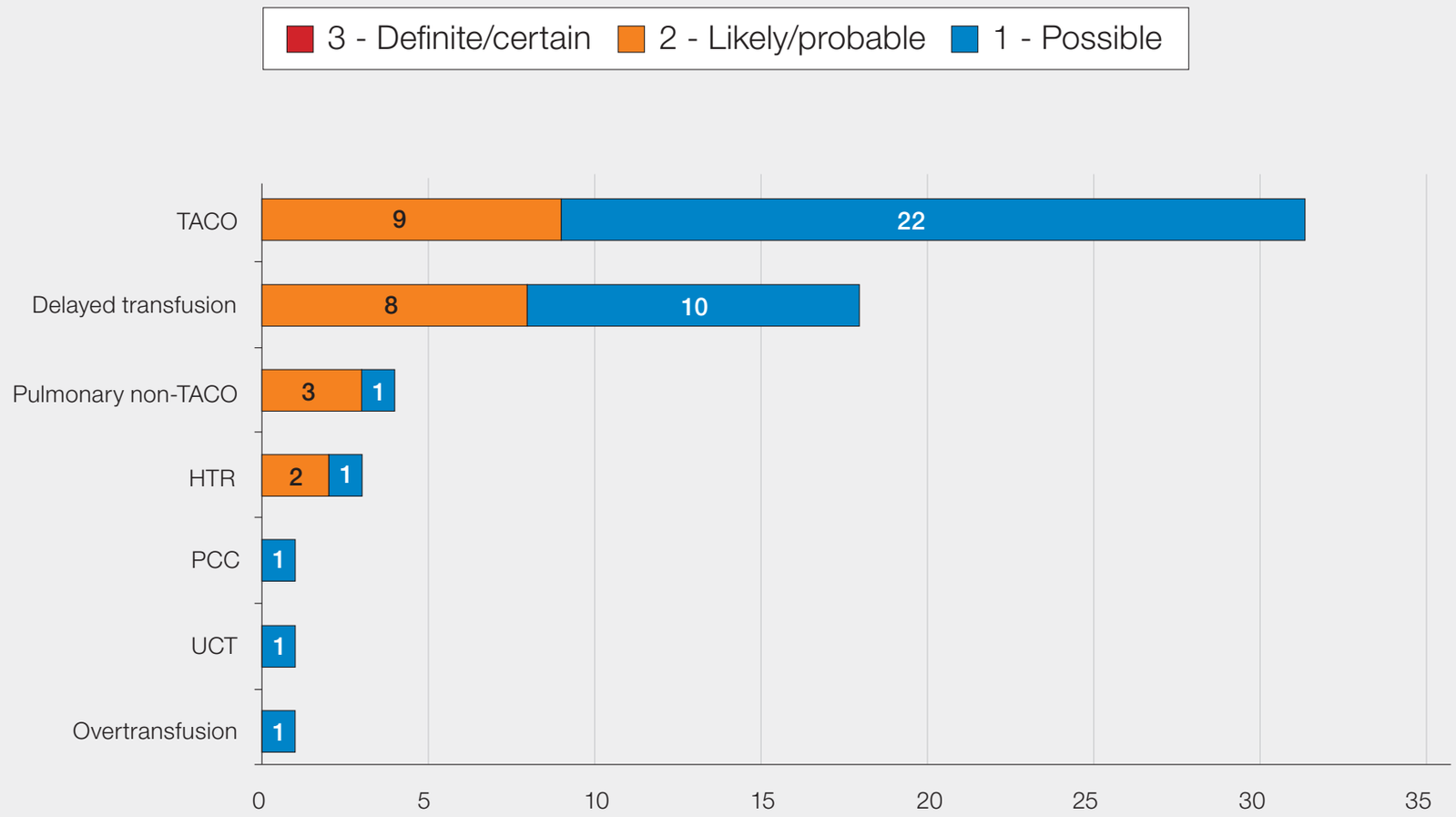


## Figure 3.2: No patient-harm and potential patient-harm incidents 2010-2024



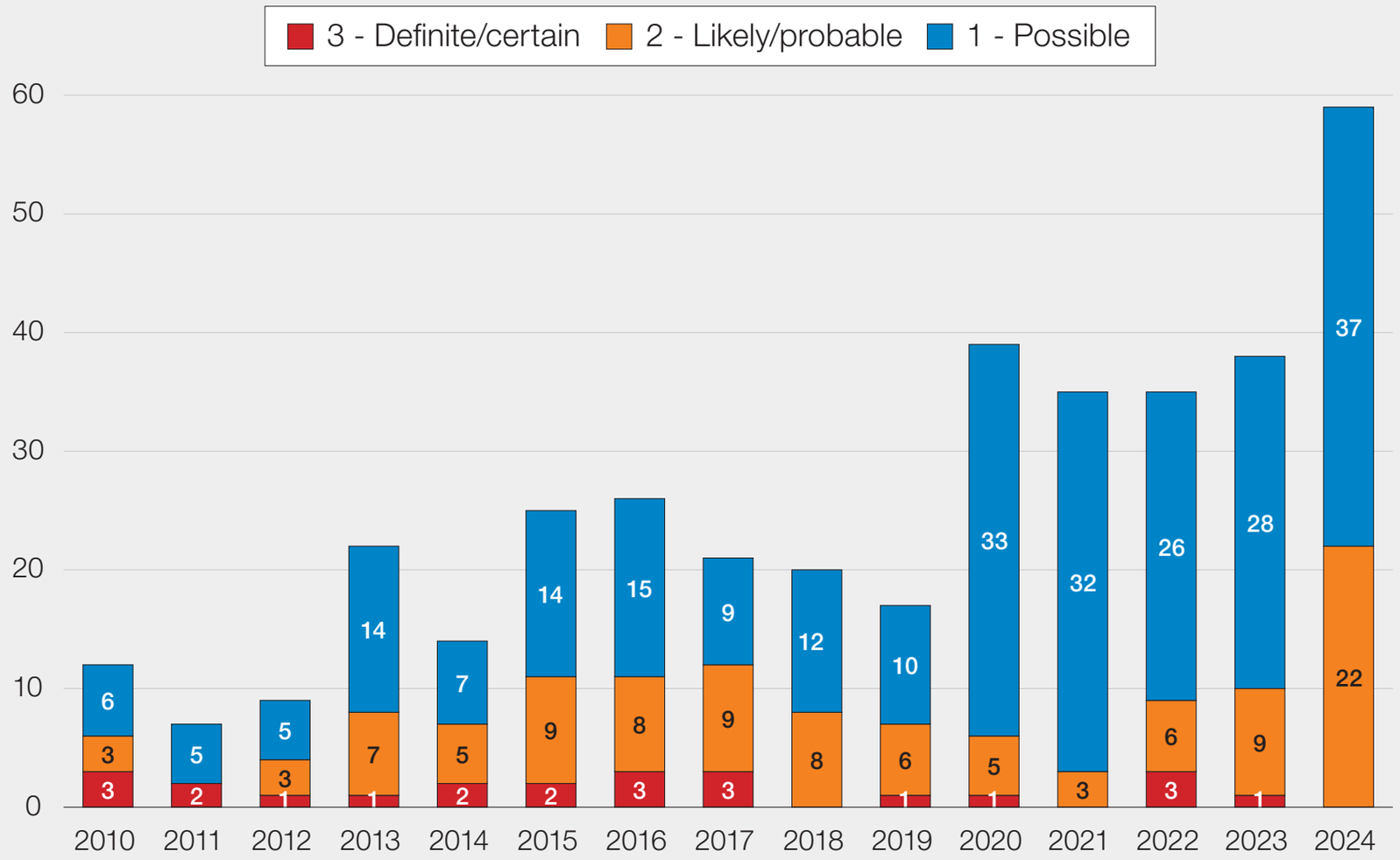

*Potential harm incidents include incorrect blood component transfused (IBCT) errors, delayed transfusion, avoidable transfusion, under or overtransfusion, incidents related to prothrombin complex concentrates, handling and storage errors (HSE) and errors related to anti-D immunoglobulin administration. 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 2024 (n=59)

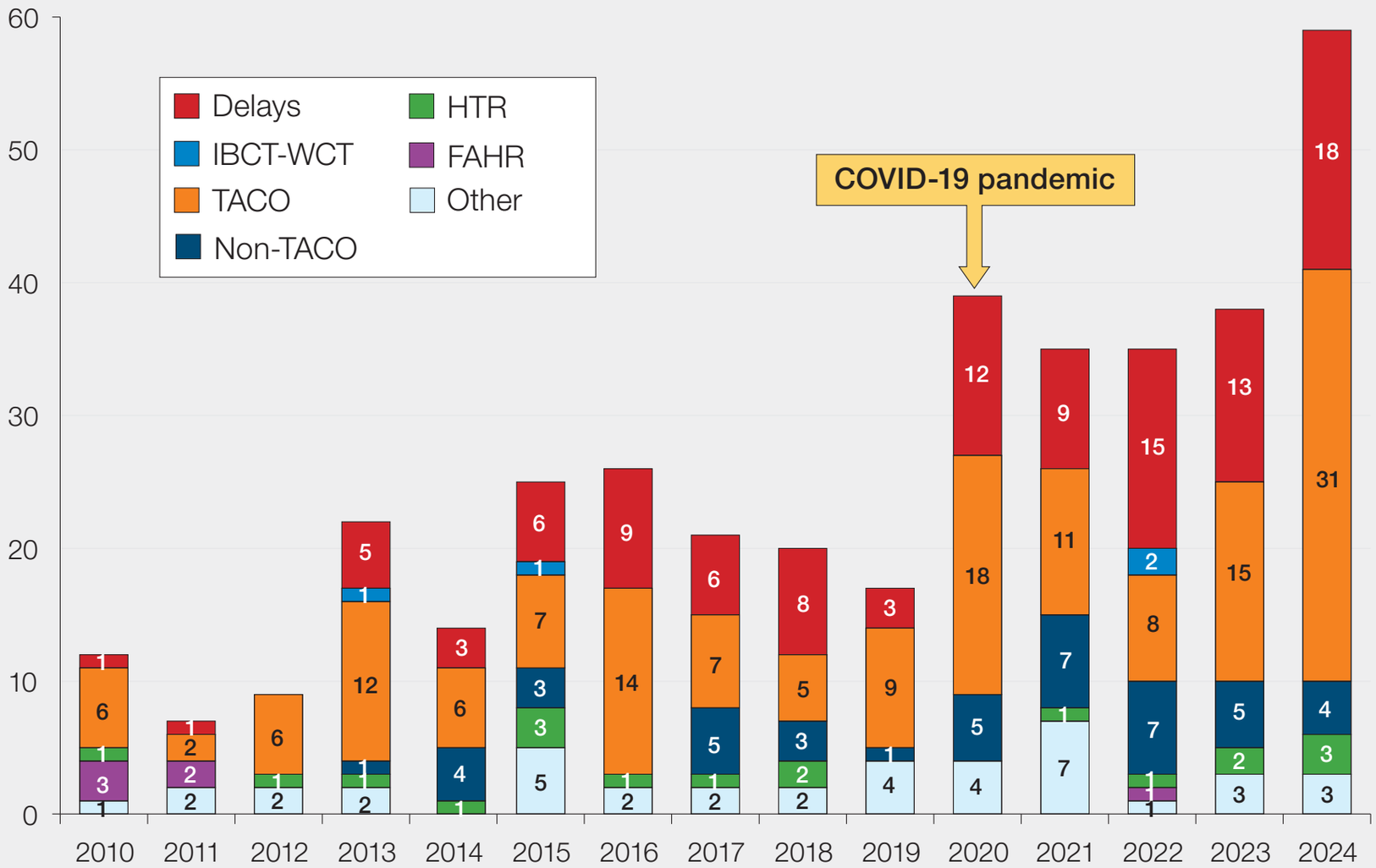



*HTR=haemolytic transfusion reactions; PCC=prothrombin complex concentrates; TACO=transfusion-associated circulatory overload; UCT=uncommon complications of transfusion*

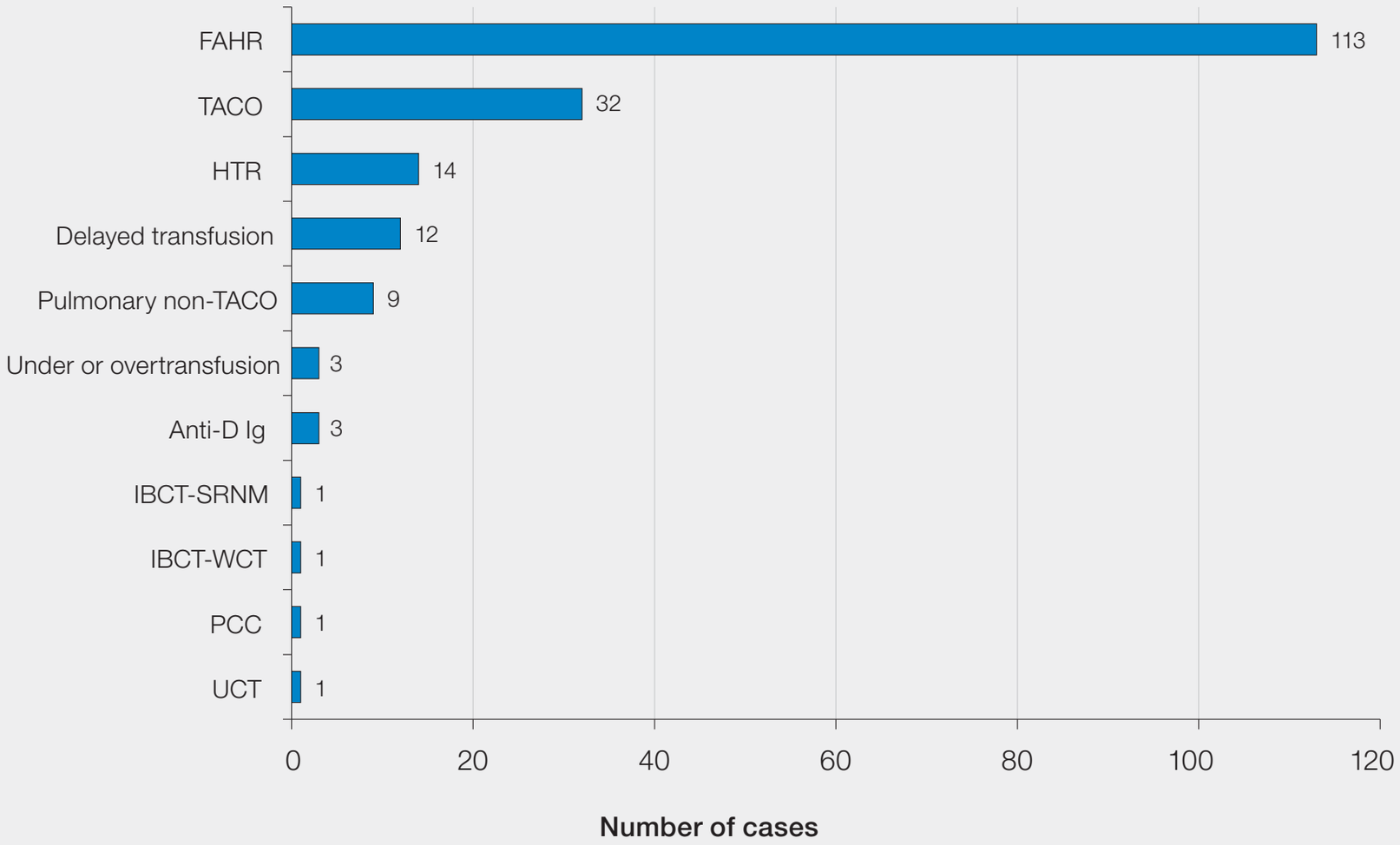
## Figure 3.4: Deaths related to transfusion with imputability reported 2010-2024 (n=379)



## Figure 3.5: Transfusion-related deaths by SHOT category, 2010 to 2024 (n=379)

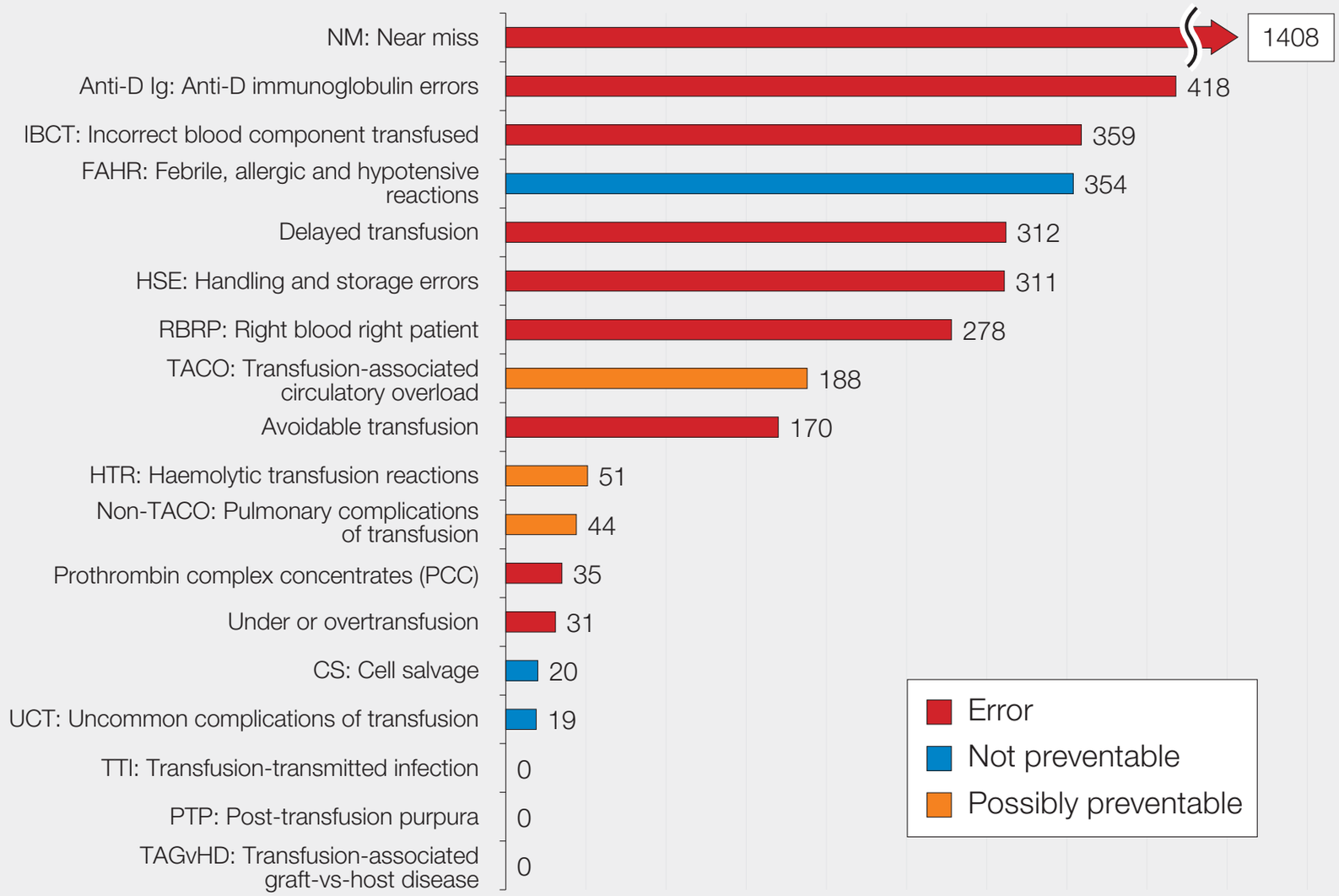


## Figure 3.6: Ranking of categories to show number of serious reactions in 2024 (n=190)

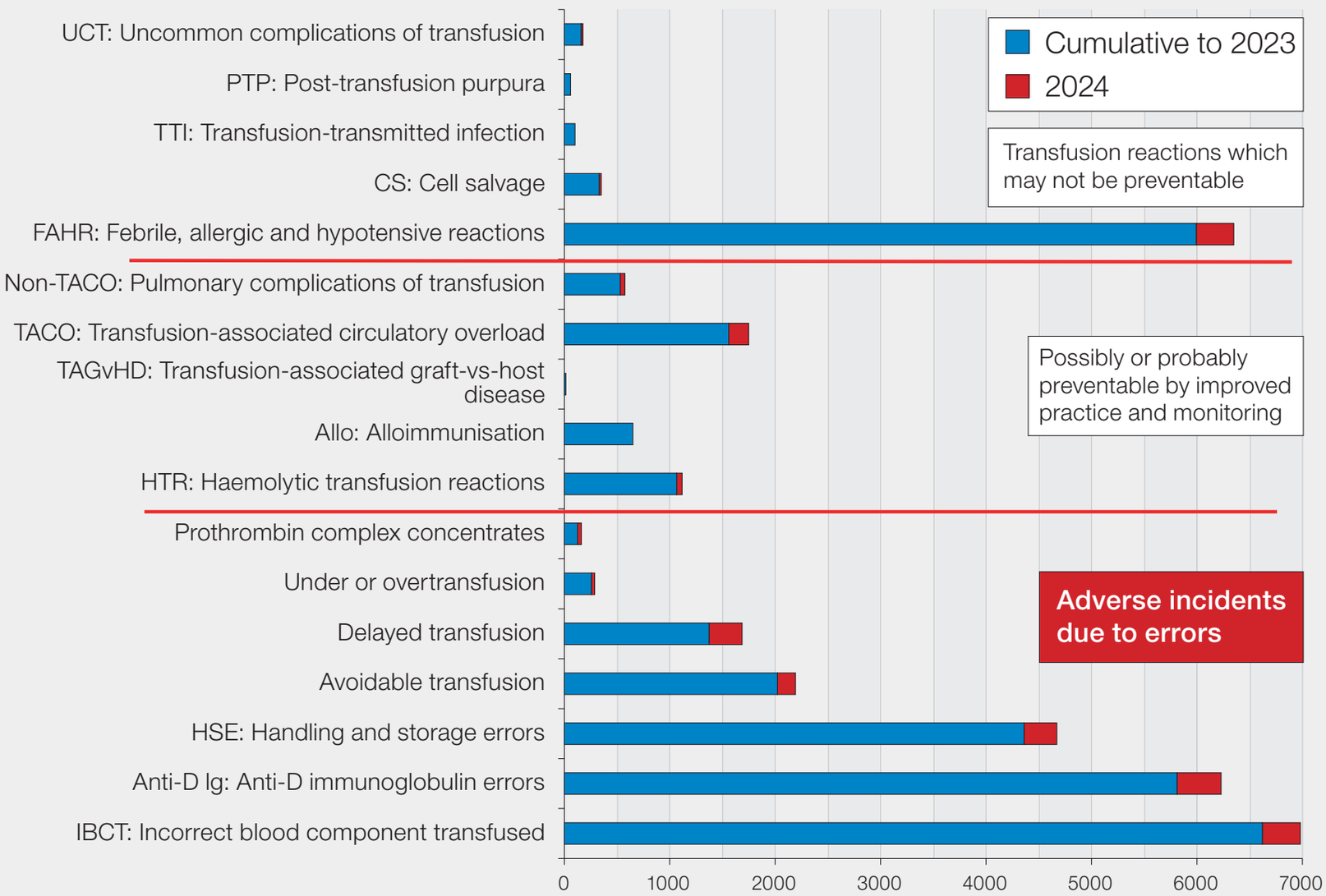



*FAHR=febrile, allergic, and hypotensive reactions; HTR=haemolytic transfusion reactions; IBCT-SRNM=incorrect blood component transfused-specific requirements not met; IBCT-WCT=IBCT-wrong component transfused; Ig=immunoglobulin; PCC=prothrombin complex concentrates; TACO=transfusion-associated circulatory overload; UCT=uncommon complications of transfusion*

## Figure 3.7: Summary data for 2024, all categories (includes RBRP and NM) (n=3998)

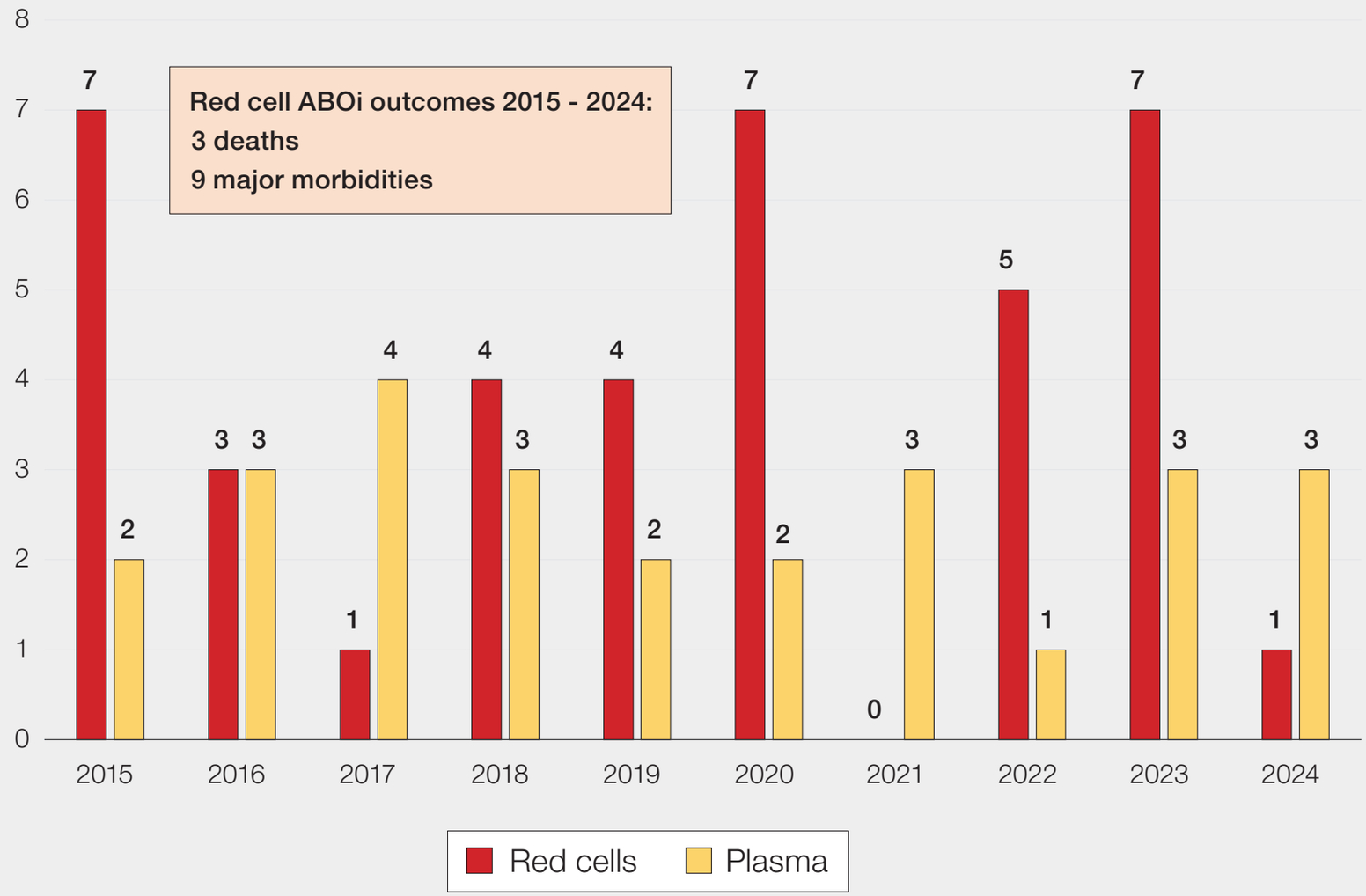


## Figure 3.8: Cumulative data for SHOT categories 1996-2024 (n=33343)




*Data on alloimmunisation has not been collected by SHOT since 2015*

## Figure 3.9: Number of ABO-incompatible (ABOi) transfusions 2015-2024



## Figure 3.10: ABO-incompatible red cell transfusions by step in the transfusion process 2015-2024 (n=39)

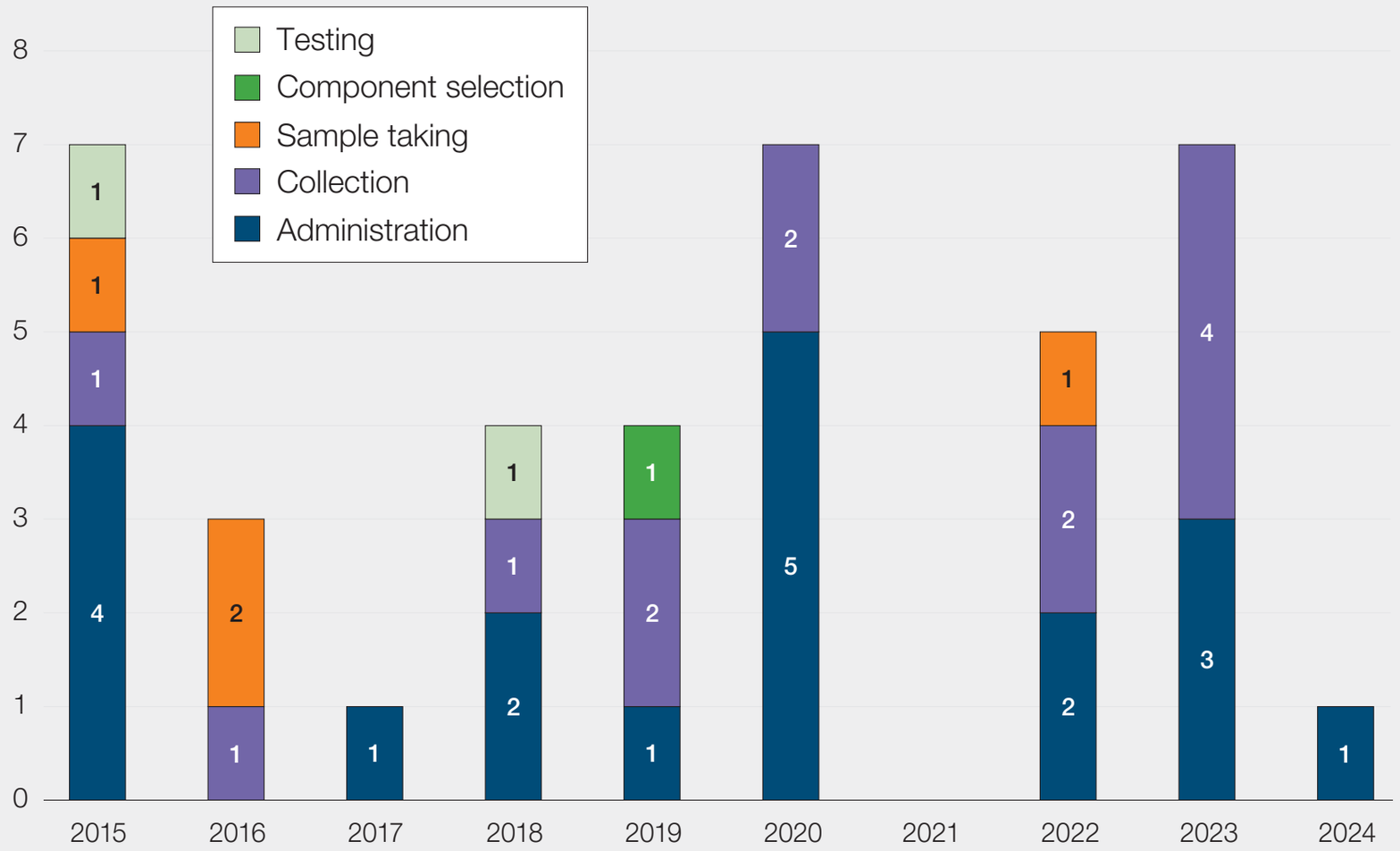
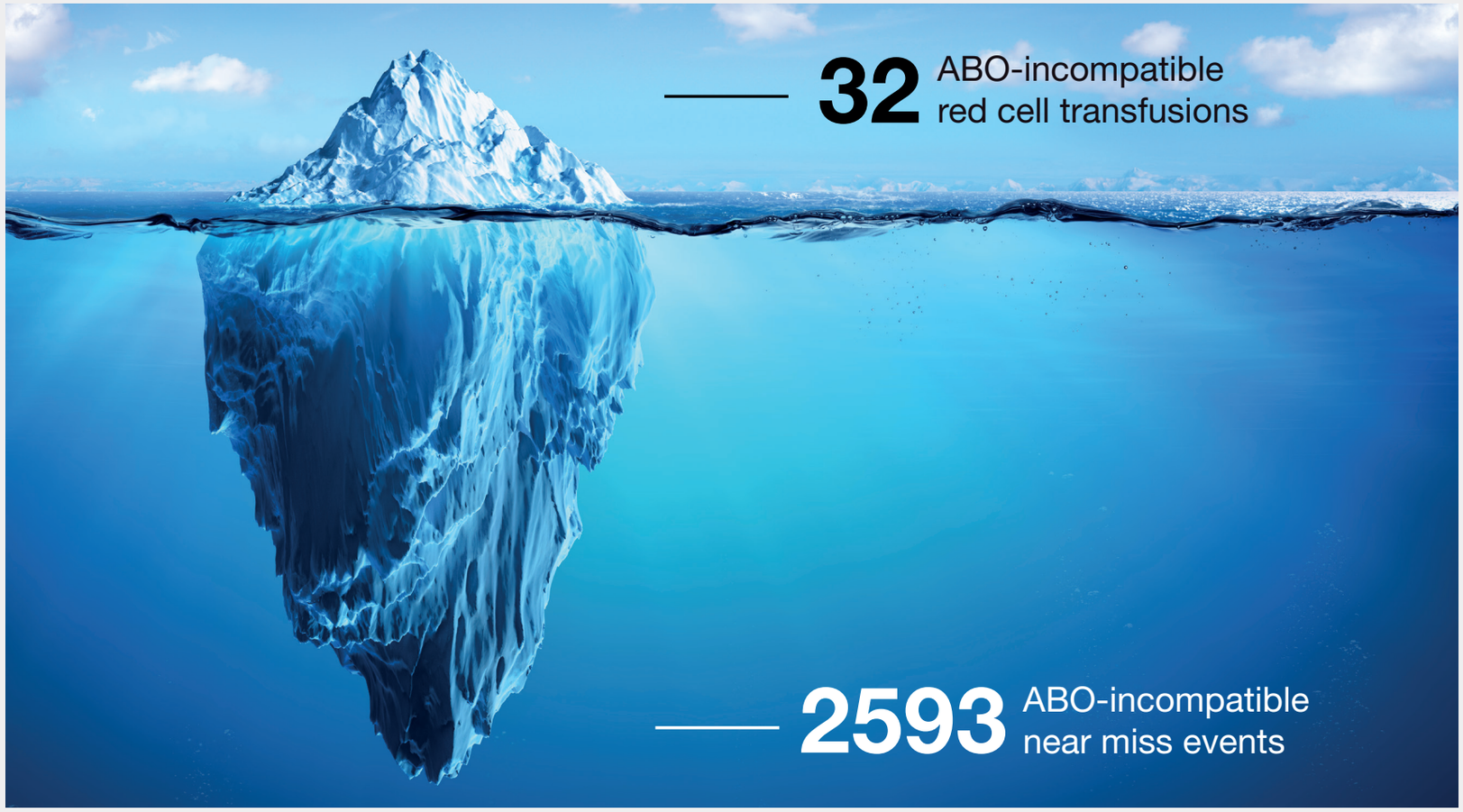


Figure 3.11: ABO-incompatible red cell transfusions 2016-2024: few events (n=32) but many near misses (n=2593)



## Figure 4.1: Patient Safety Principles set out by the Patient Safety Commissioner, England

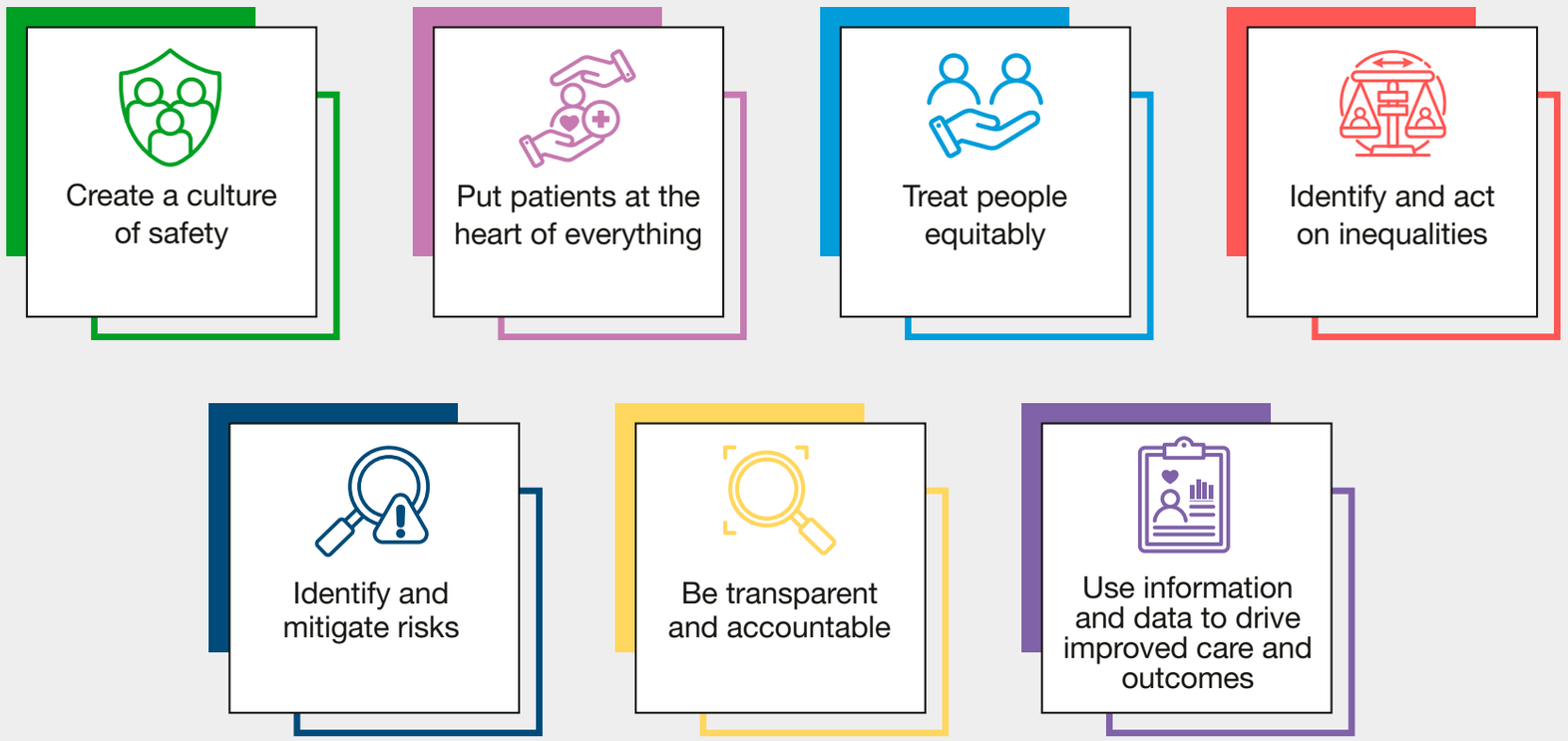
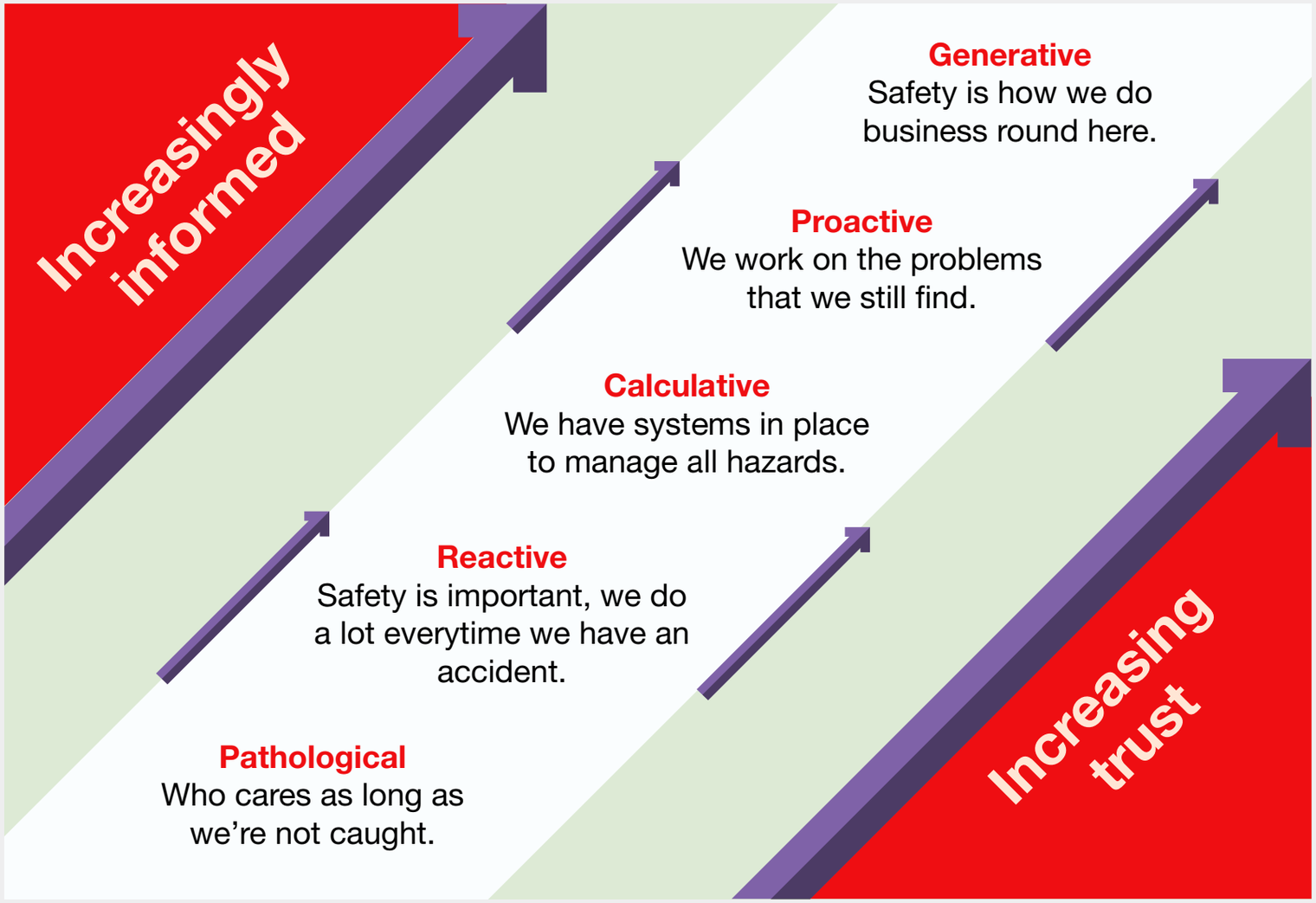


Figure 4.2: The evolution of a safety culture




*Adapted from Hudson, P., 2001. Safety culture: The ultimate goal. Flight Safety Australia, pp. 29-31.*

## Figure 5.1: Framework to transfer IDEAS of excellence into practice

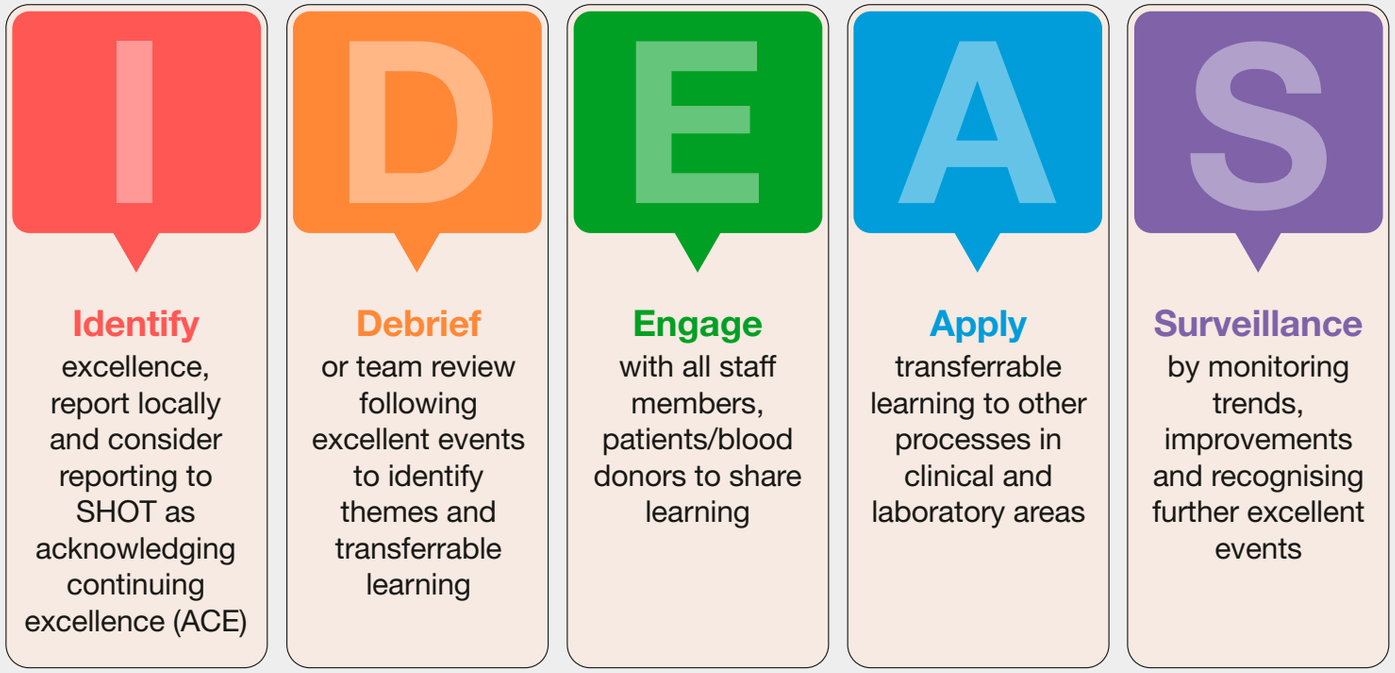
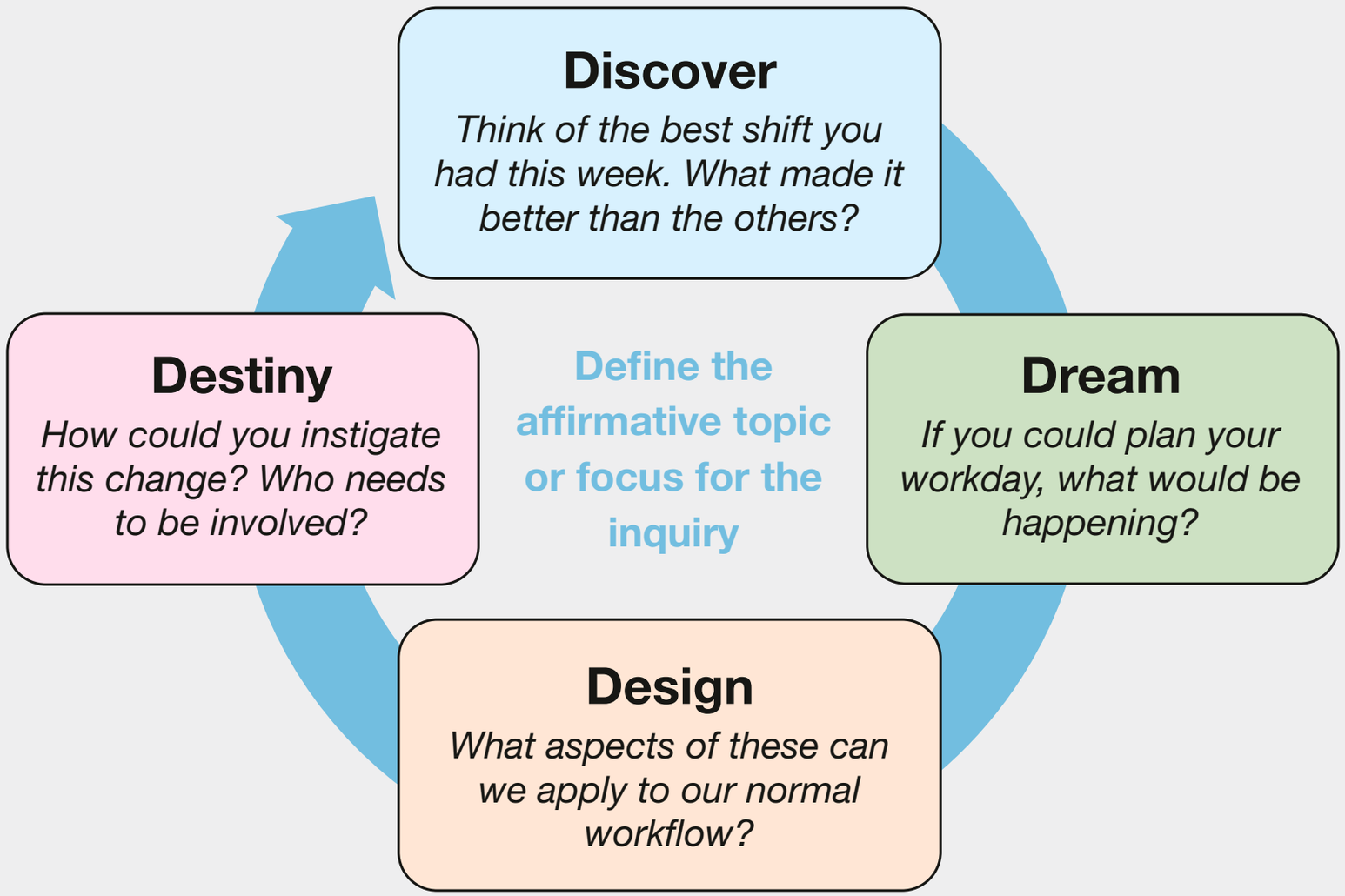


Figure 5.2: Appreciative Inquiry process with example questions




*This figure shows the '4D cycle' for appreciative inquiry on a mutually agreed affirmative topic (Cooperrider & Whitney, 2005) with questions from the NHS England introductory module on appreciative inquiry (Russo, 2022)*

# Serious adverse events following blood donation reported to the UK Blood Services in 2024

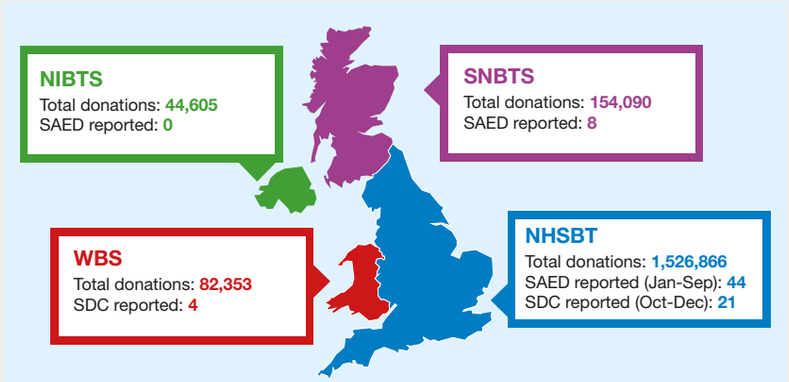
## Serious adverse events following blood donation reported to the UK Blood Services in 2024

2024 has seen the gradual transition of the UK Blood Services away from serious adverse events of donation (SAED) which focused on grouping based on category to serious donor complications (SDC) which focuses on impact to the donor based on severity. The introduction of donor severity grading for adverse events also allows for a benchmarking via a uniform standard for all UK Blood Services and internationally.

**SAED** (Pre 2024)
- Serious adverse event of donation
- Focused on grouping by category

**Transition** (2024)
- SAED phased out
- SDC introduced

**SDC** (From 2024)
- Serious donor complications
- Focuses on impact to individual

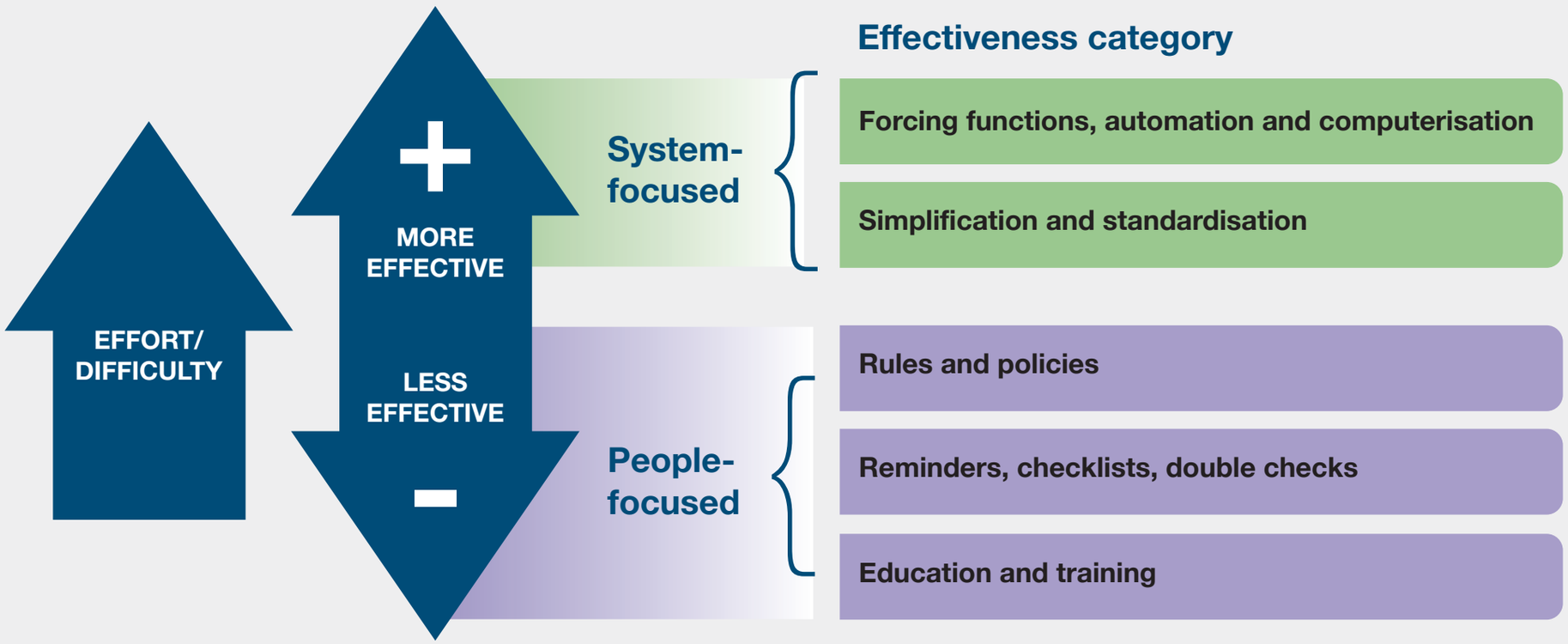



*NHSBT=National Health Service Blood and Transplant; NIBTS=Northern Ireland Blood Transfusion Service; SNBTS=Scottish National Blood Transfusion Service; WBS=Welsh Blood Service*

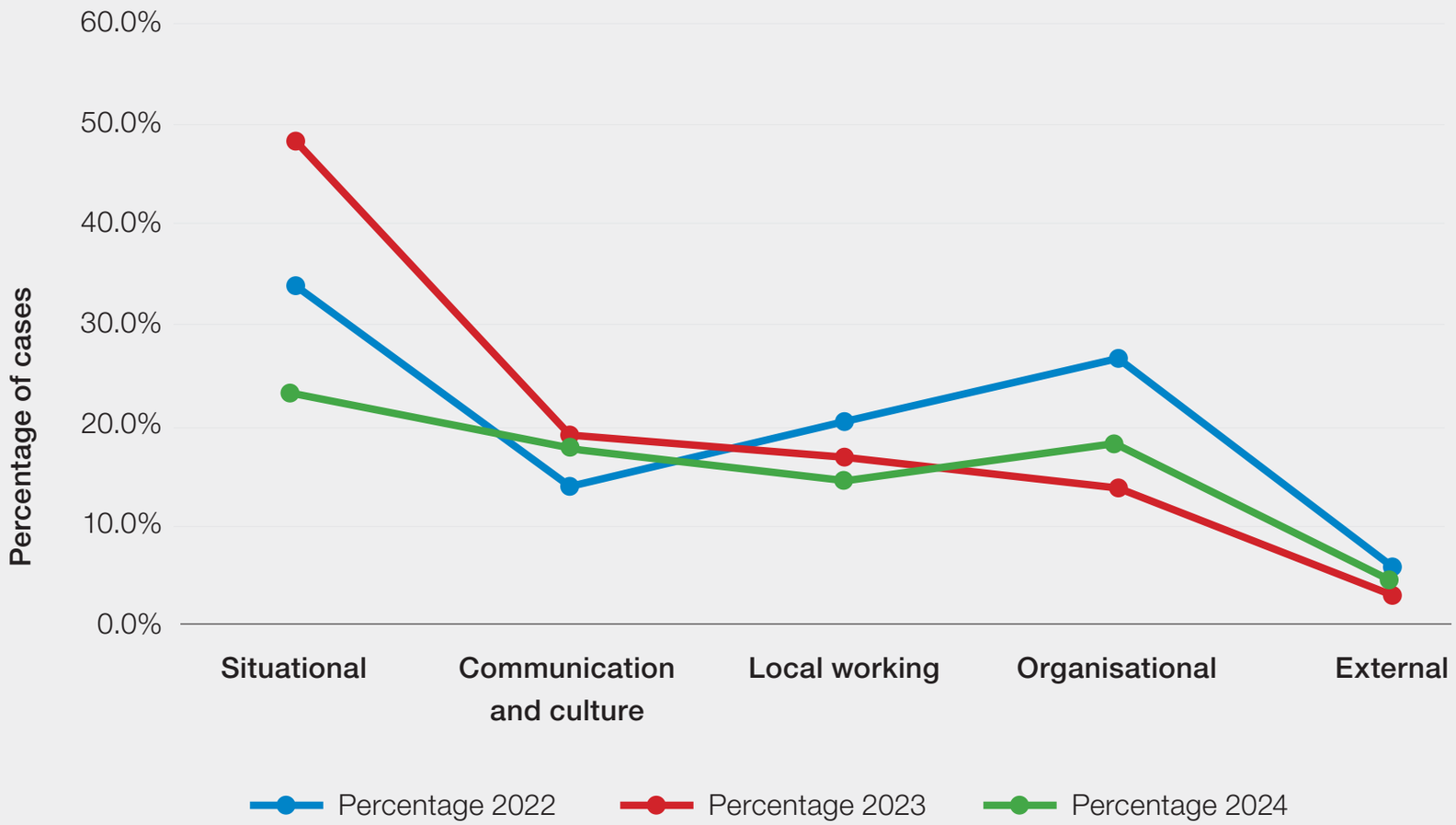
**Key messages:**

1. The rate of serious donor complications in the UK is one SAED/SDC per 23,479 donations
2. Arm pain from needle insertion and vasovagal reactions remain the most common complications reported
3. Donor complications can occur despite best care, and some may have serious impact on donors
4. Improving donor experience with measures to reduce risk of complications related to blood donation along with prompt recognition and management of complications is vital
5. Blood Services must ensure that all donors are aware of the importance of reporting all adverse events of donation so the donor can be appropriately managed, and the adverse events can be recorded, monitored and appropriate actions taken to improve donor safety

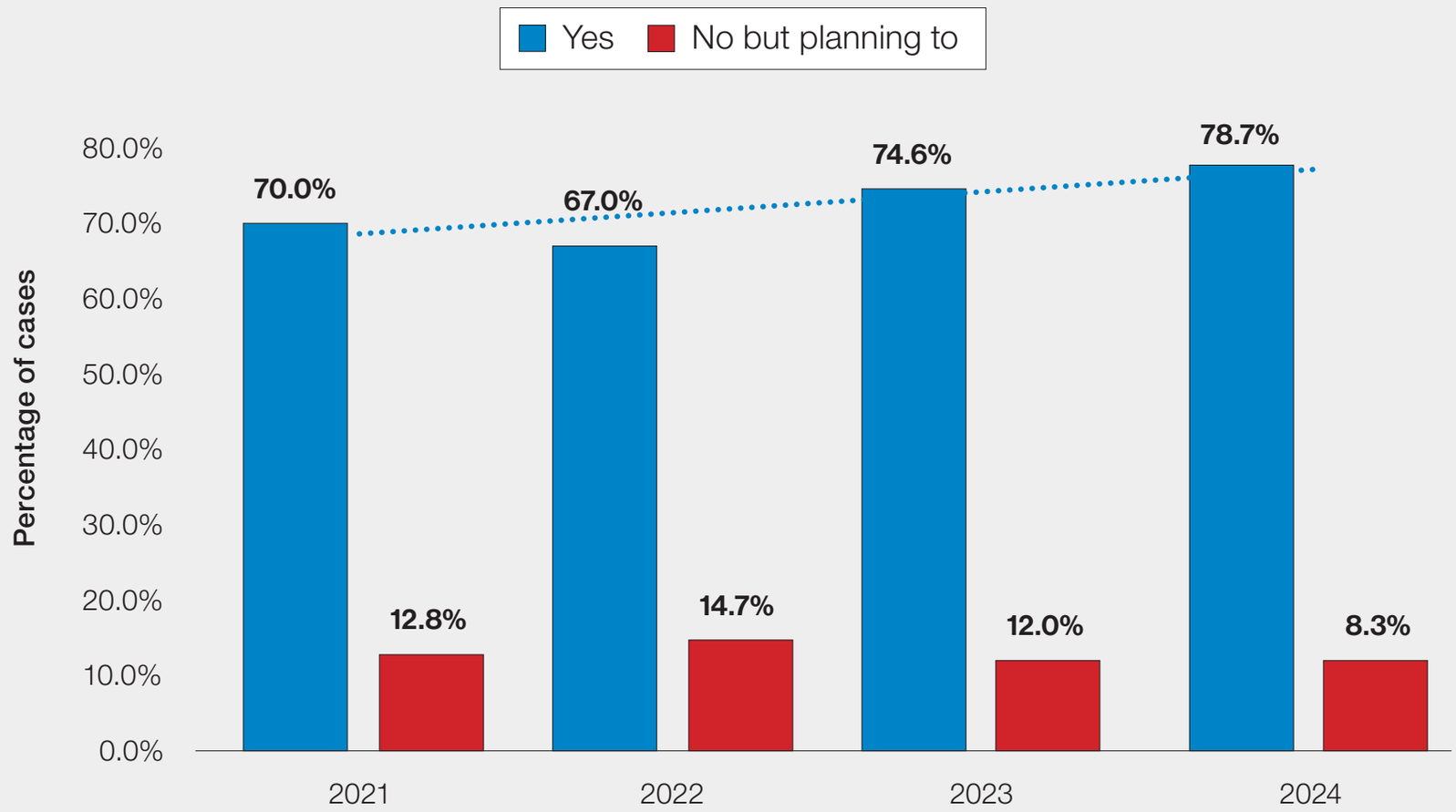
Figure 7.1: HFIT questions for reporters to rank main actions against their effectiveness category



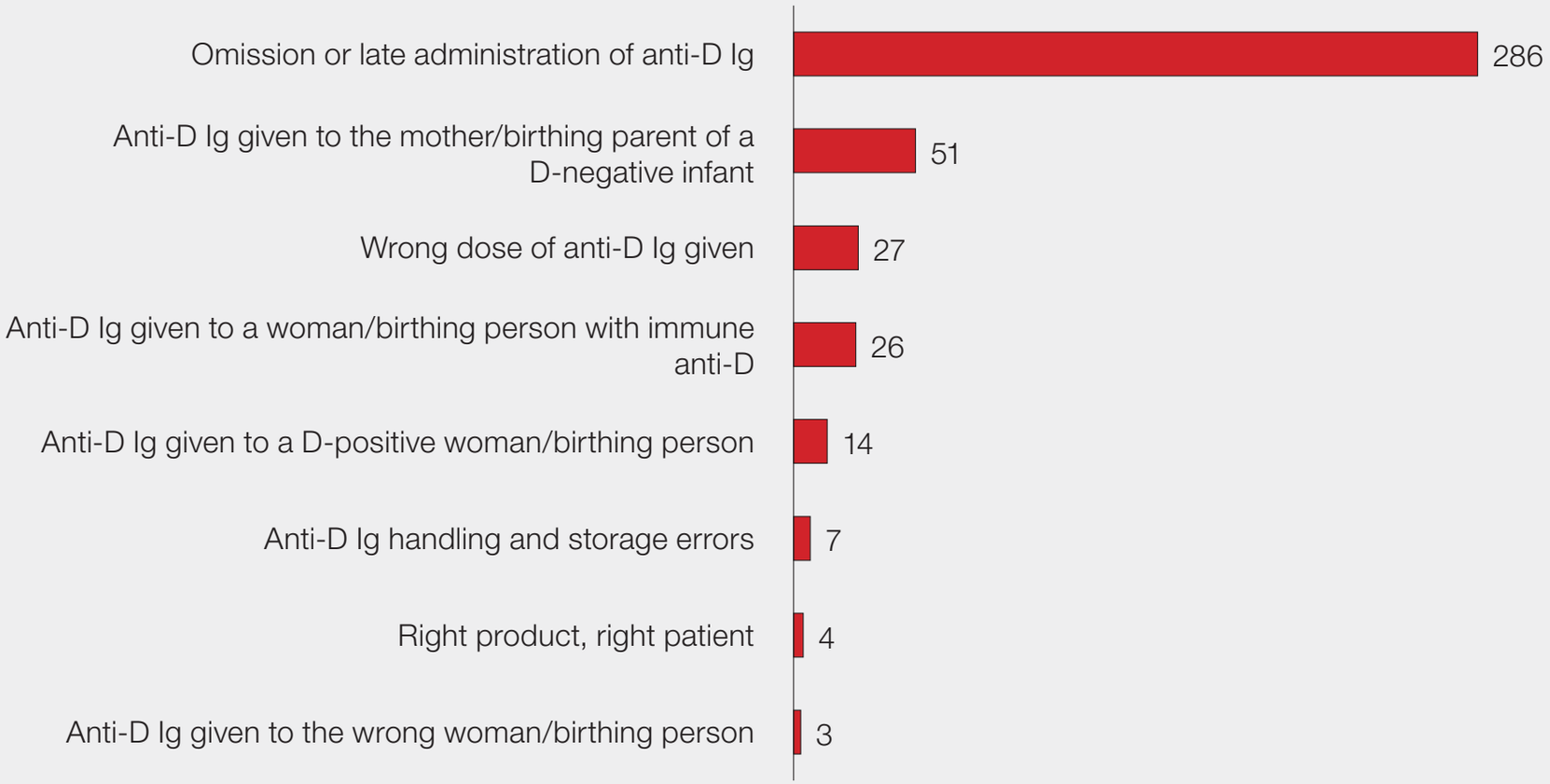
## Figure 7.2: A comparison of HFIT categories assigned by SHOT reporters in 2022, 2023 and 2024



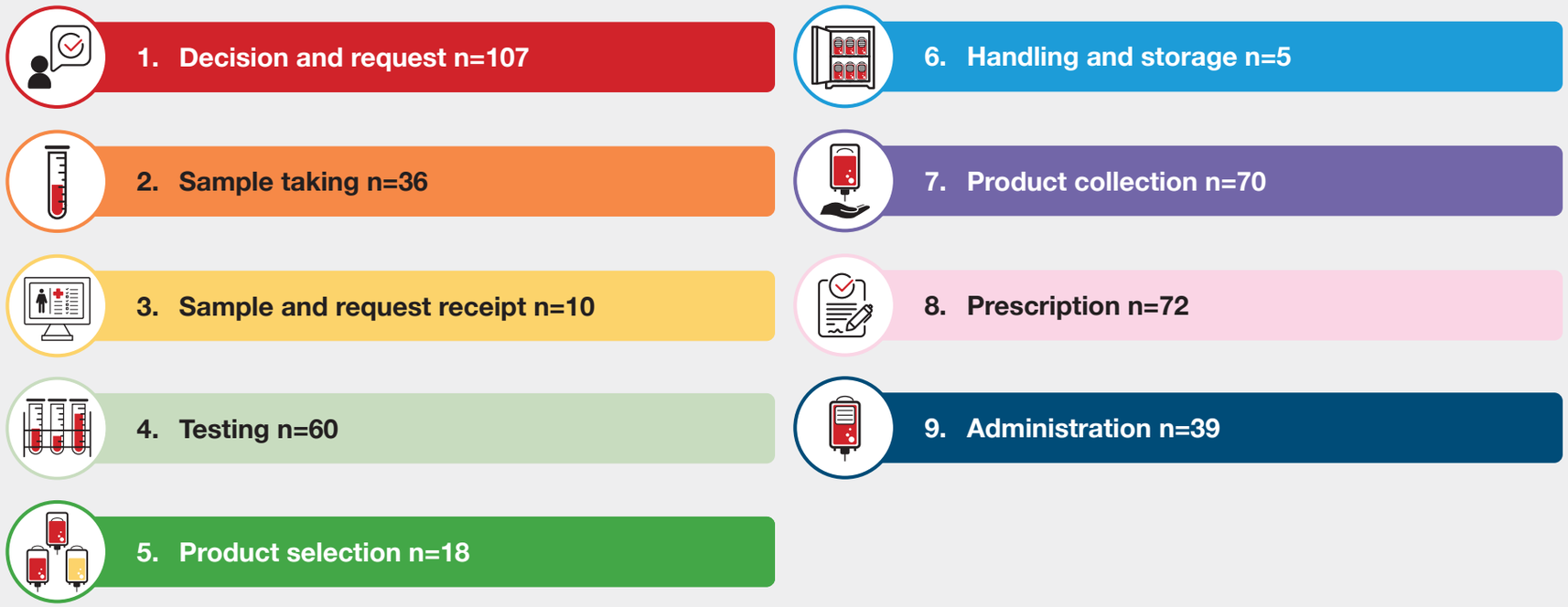
## Figure 7.3: Percentage of cases investigated using HFE principles or framework 2021-2024



## Figure 8.1: Distribution of anti-D immunoglobulin (Ig) related error reports in 2024 (n=418)

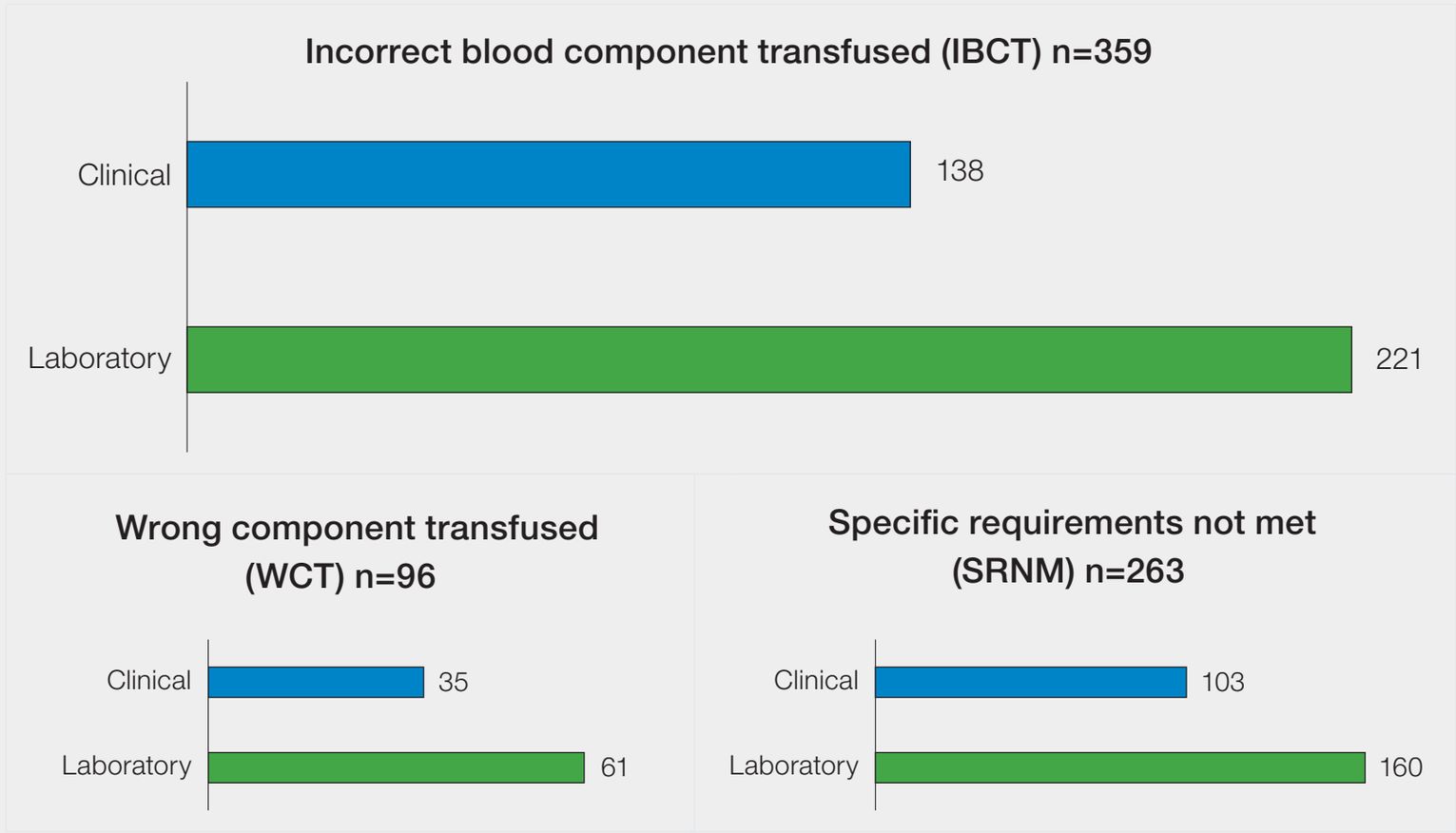


## Figure 8.2: Steps in the transfusion pathway when the anti-D Ig errors occurred in 2024

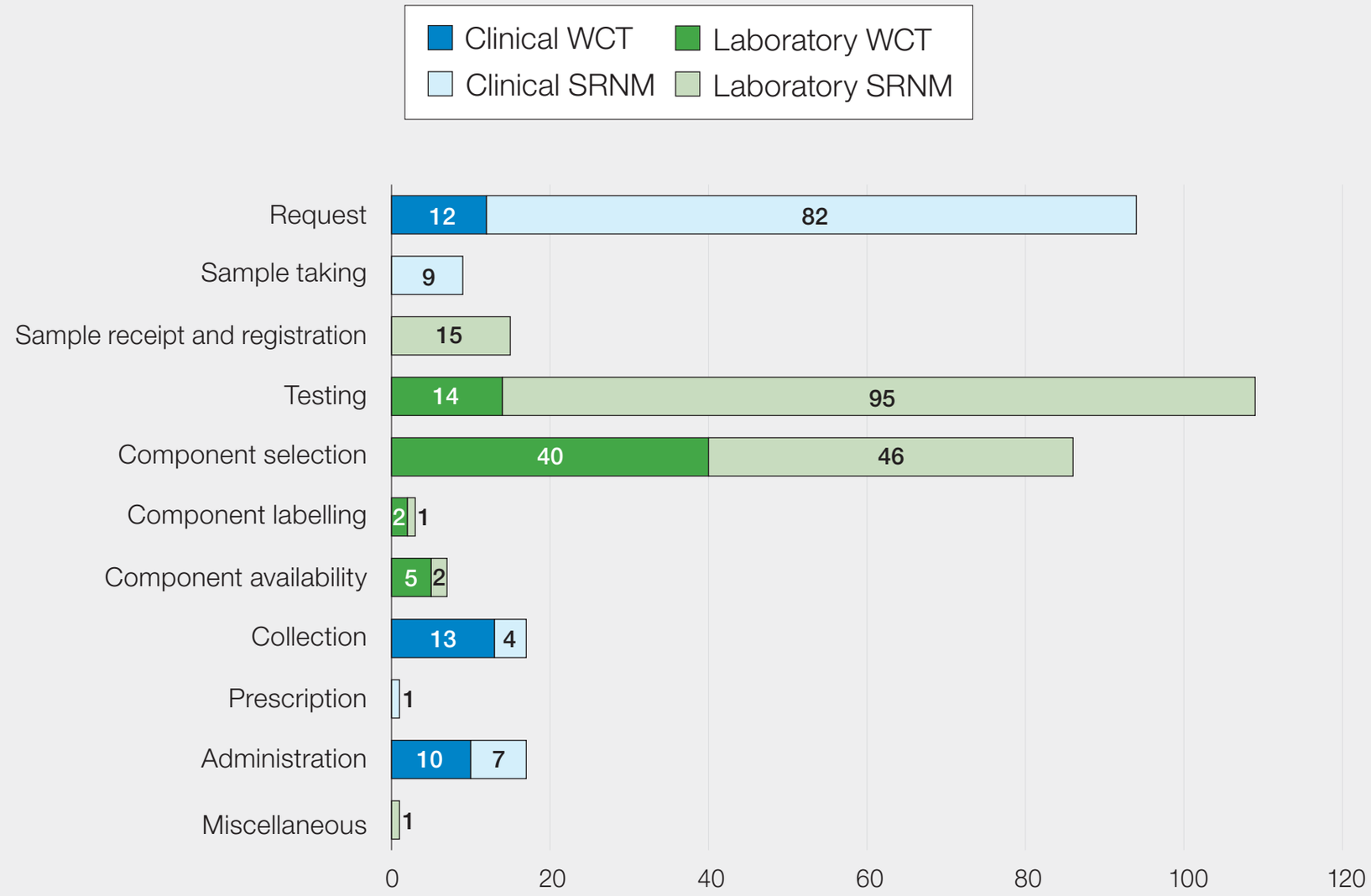



*In 1 miscellaneous case (not included in Figure 8.1) there were two missed RAADP appointments, however it was not confirmed whether the woman had been thoroughly informed of the potential consequences of not receiving anti-D Ig in a timely manner*

## Figure 9.1: Overview of reports where an incorrect blood component was transfused in 2024 (n=359)

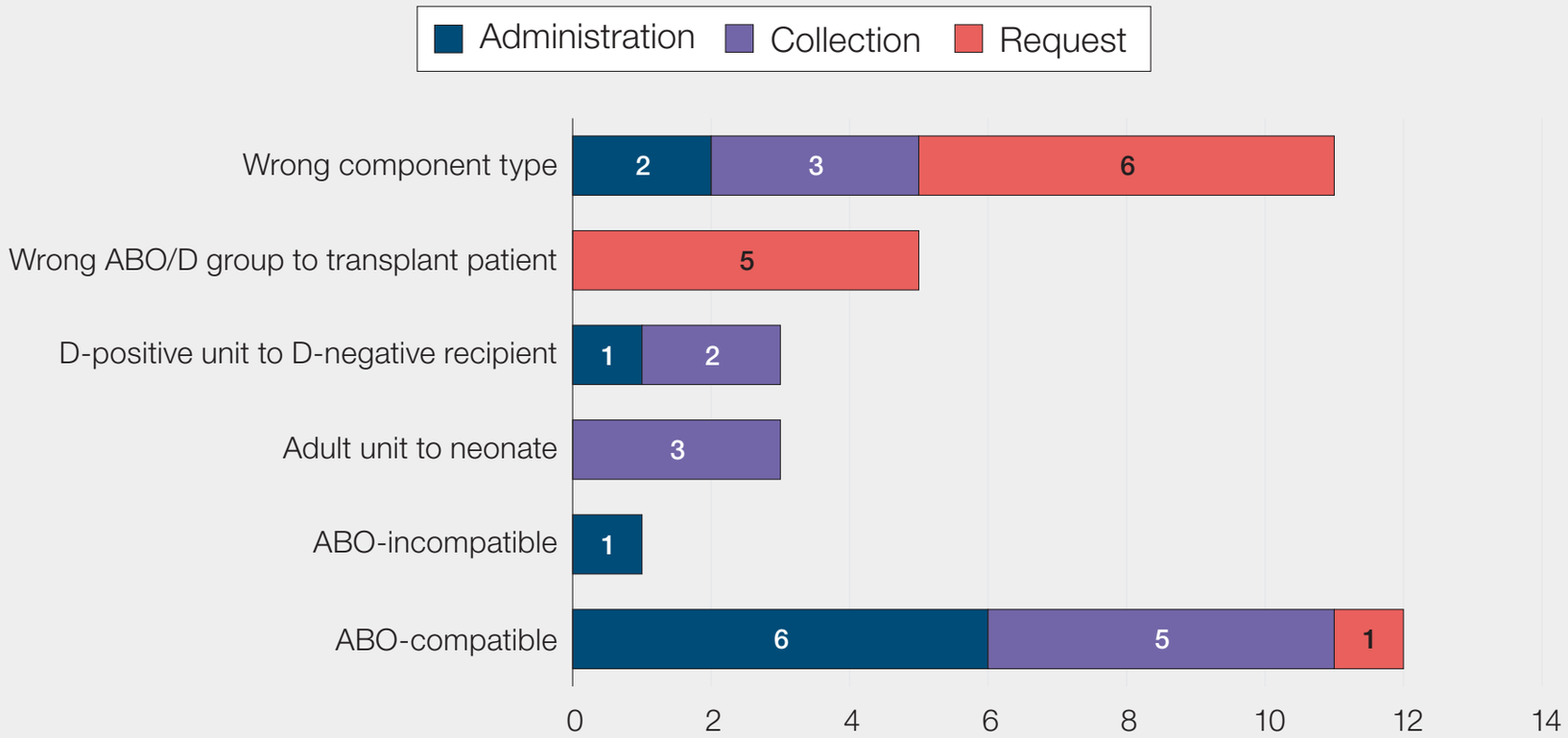


## Figure 9.2: Total IBCT errors in 2024 categorised by the step in the transfusion process where the primary error occurred (n=359)

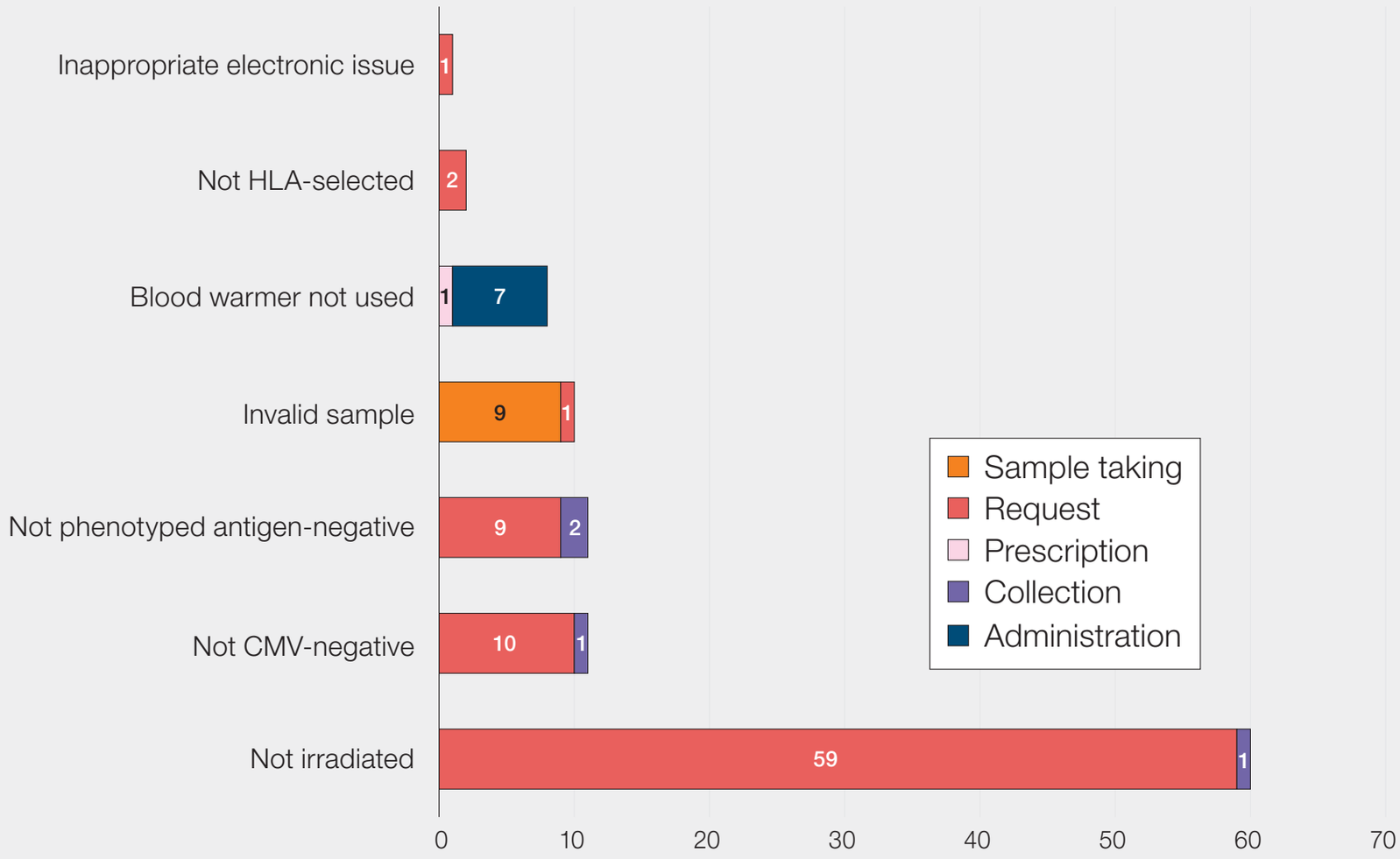



*WCT=wrong component transfused; SRNM=specific requirements not met*

## Figure 9.3: Clinical IBCT-WCT errors and transfusion step where the error occurred in 2024 (n=35)



## Figure 9.4: Clinical IBCT-SRNM errors and transfusion step where the error occurred in 2024 (n=103)




*HLA-human laecocyte antigen; CMV=cytomegalovirus*

## Figure 9.5: Causal and contributory factors for IBCT clinical errors in 2024

### Pre-administration checklist failure

A pre-administration checklist was used in 95/138 (68.8%) events yet did not detect the error. Common themes for checklist failure included no instruction to check prescription, or prescription not including specific requirement

### Pre-administration checklist not used

A pre-administration checklist was not used in 28/138 (20.3%) cases, with only 9/28 (32.1%) stating that the error would have been detected had one been used using their current checklist

### Pre-administration Checklist format

Errors occurred using both paper, 58/95 (61.1%), and electronic, 37/95 (38.9%), pre-administration checklists

### Gaps in skills and knowledge

Gaps in clinical staff skills and knowledge continue to contribute to transfusion errors

### Checking failures

Most errors occurred when there were two independent pre-administration checkers, 60/138 (43.5%)

### Information technology

IT was involved in 80/138 (58.0%) of the errors mainly due to not informing the laboratory of transfusion requirements due to their clinical picture, which prevented the laboratory updating their LIMS with appropriate flags and rules

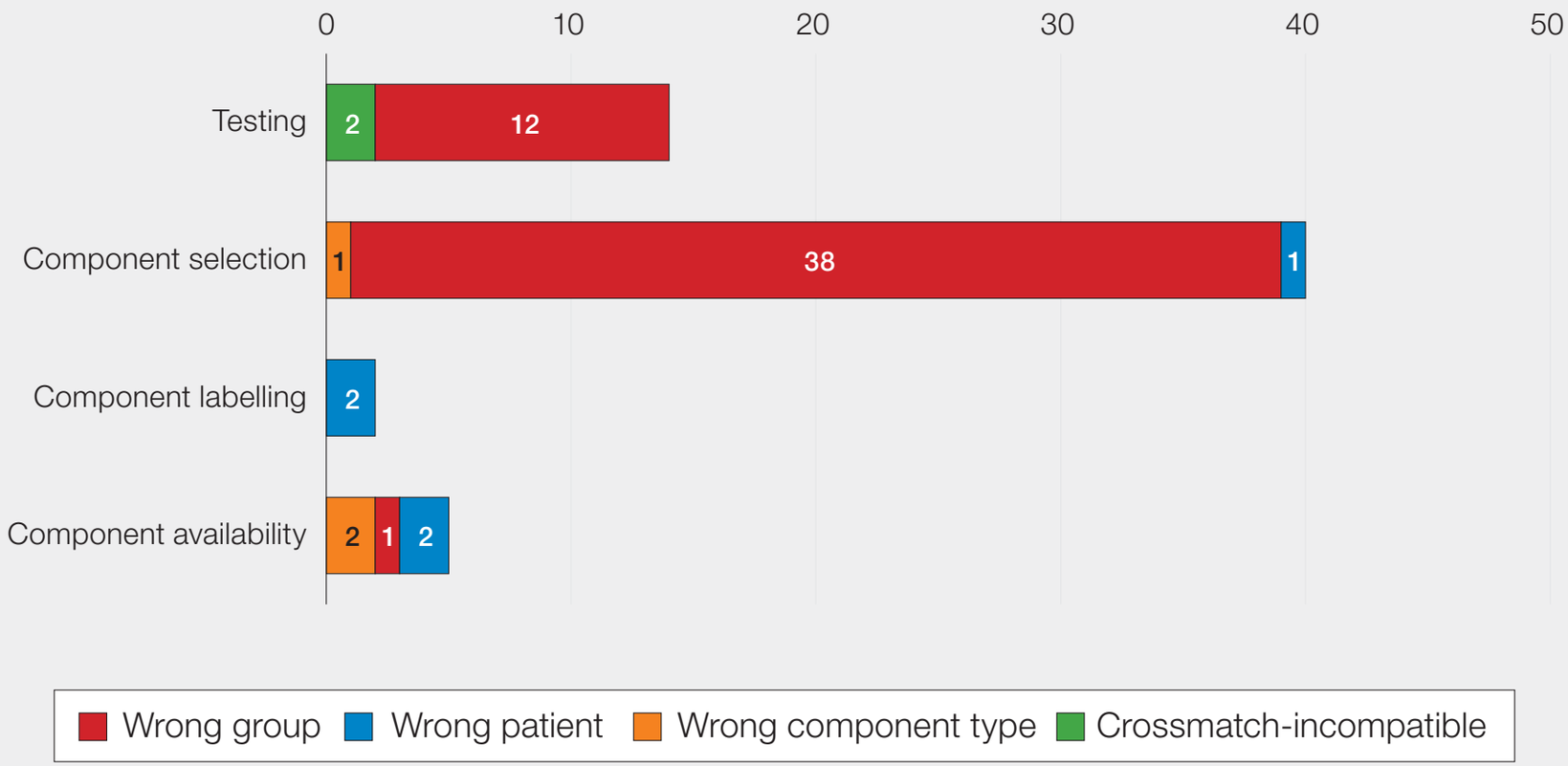
### Communication gaps

Nearly half of errors stated that communication gaps worsened the situation

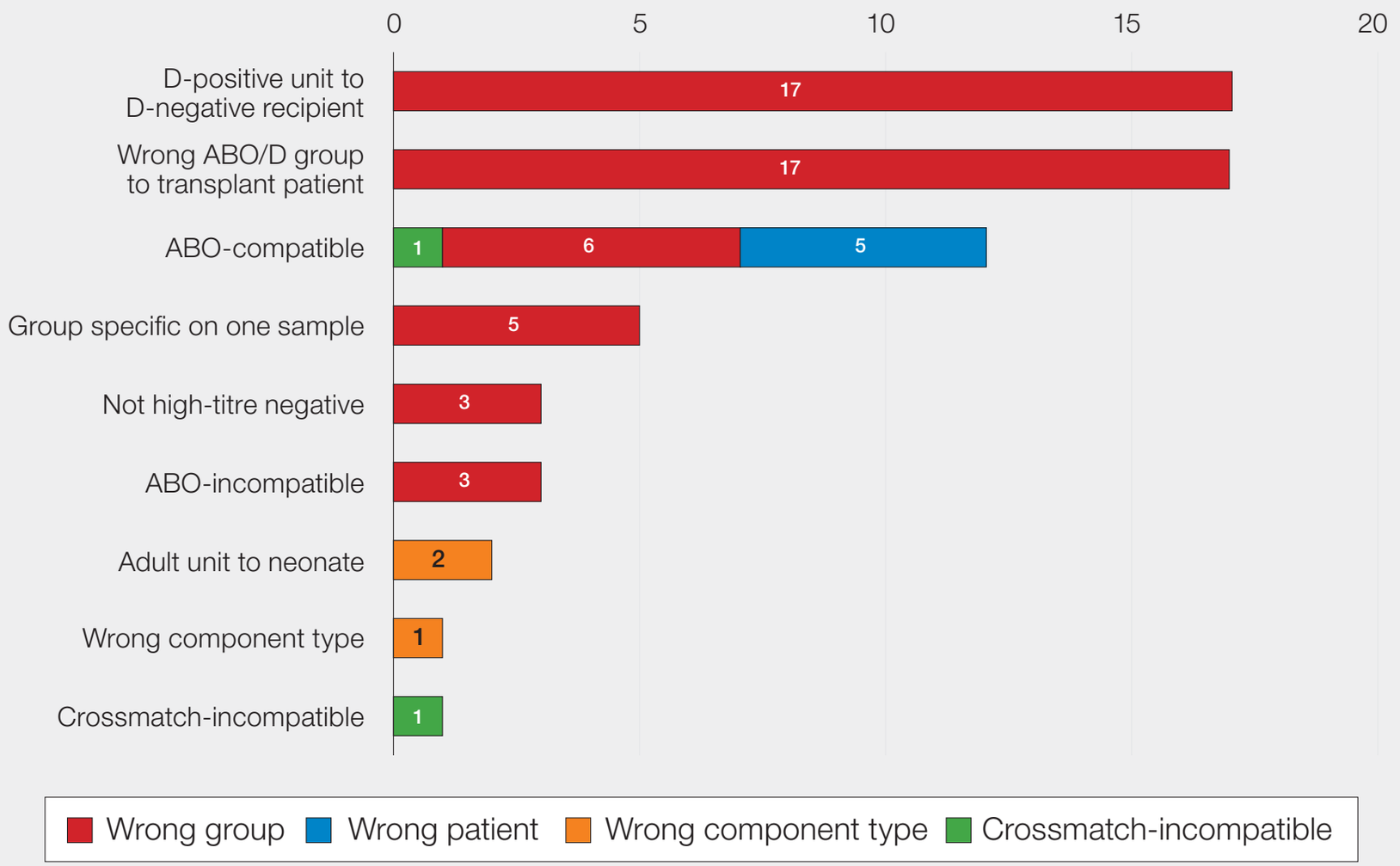
### Team function

Failures in team function also contributed to clinical errors

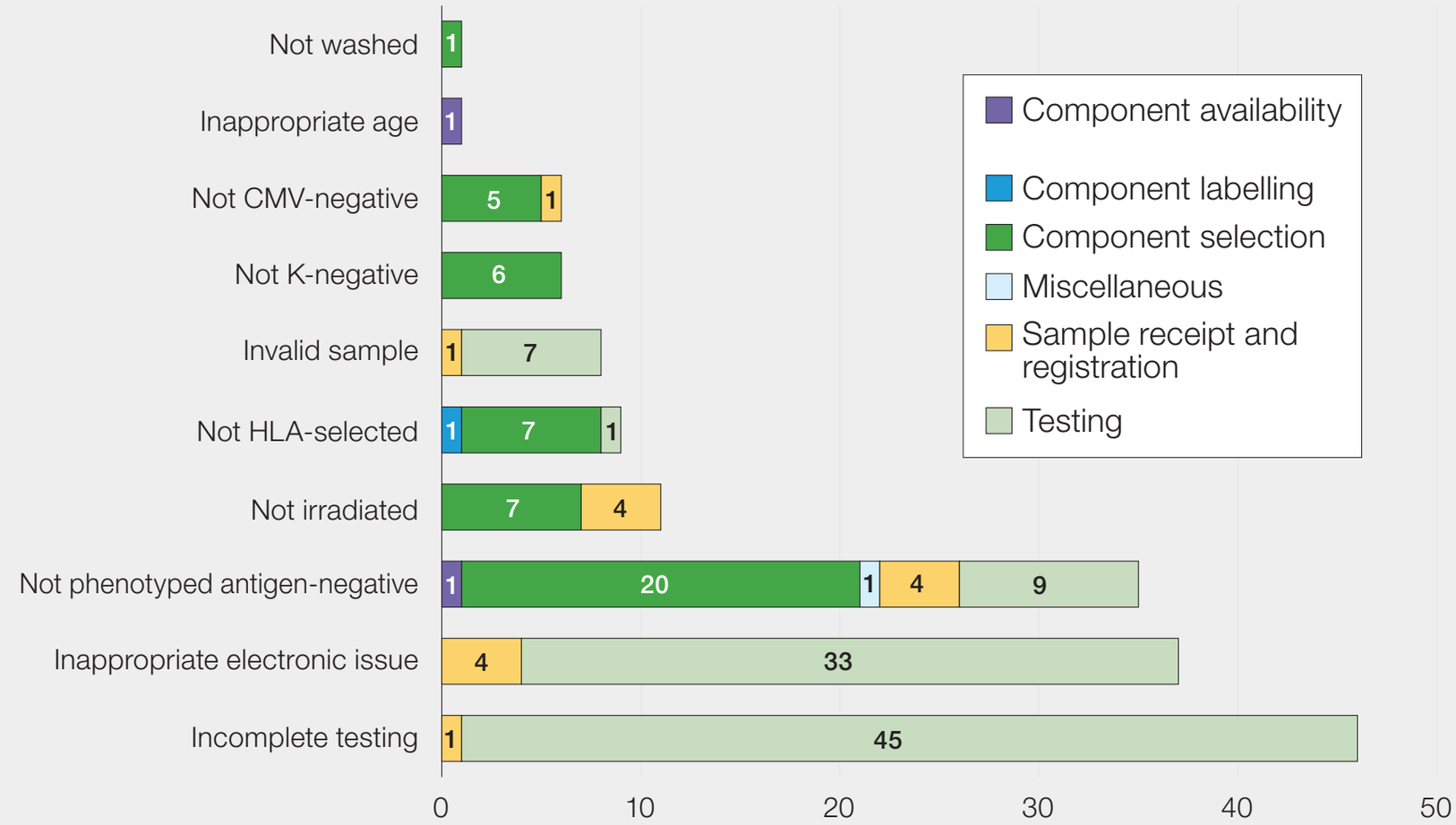
## Figure 9.6: Laboratory IBCT-WCT errors by transfusion step in 2024 (n=61)



## Figure 9.7: Laboratory IBCT-WCT error by category in 2024 (n=61)

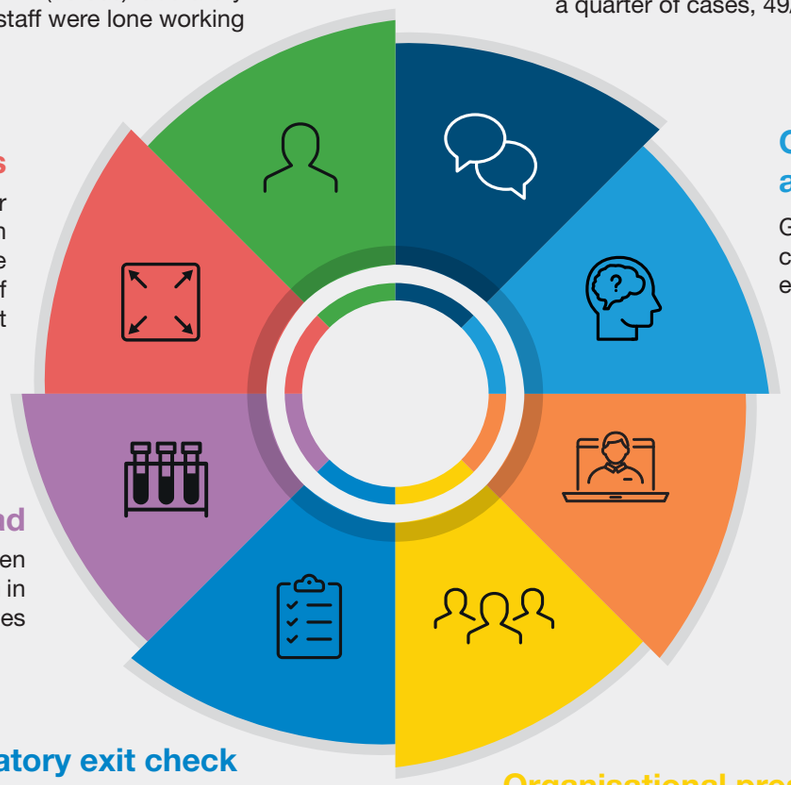


## Figure 9.8: Laboratory IBCT-SRNM errors by transfusion step in 2024 (n=160)




*HLA-human laecocyte antigen; CMV=cytomegalovirus*

## Figure 9.9: Causal and contributory factors to IBCT laboratory errors in 2024



### Lone working

Errors occurred outside of normal working hours in 95/221 (43.0%) and in 75/221 (33.9%) laboratory staff were lone working

### Communication gaps

Communication gaps worsened the situation in nearly a quarter of cases, 49/221 (22.2%)

### Capacity plans

Capacity plans were in place for 176/221 (79.6%) cases, of which 162/176 (92.0%) said that the capacity was met at the time of the event

### Gaps in skills and knowledge

Gaps in knowledge was cited as a contributory factor in 57/221 (25.8%) errors

### Information technology

Many errors involved IT, 150/221 (67.9%), of which 67/150 (44.7%) were related to LIMS warning flags. Of these 29/67 (43.3%) were due to IT flags in place but being overridden. In 28/150 (18.7%) there was a lack of functionality/algorithms in the IT system to support safe practice

### Workload

There was a mismatch between workload and staffing provision in 38/221 (17.2%) cases

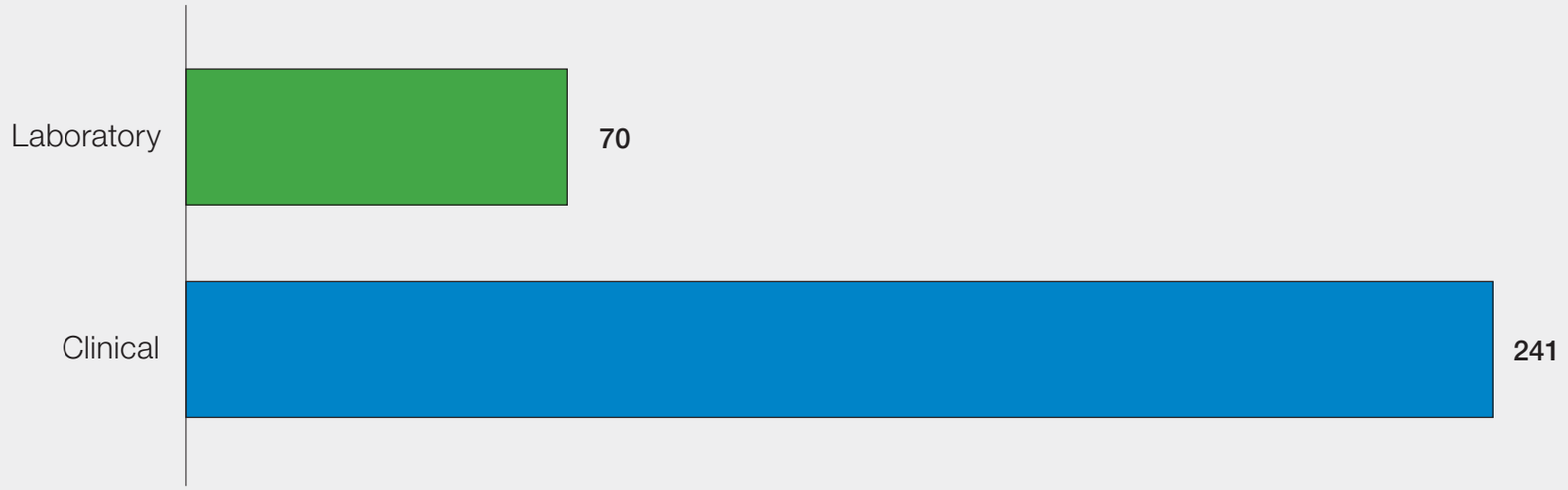
### Laboratory exit check

A laboratory exit check was in place for 147/221 (66.5%) cases, yet the error was not detected prior to release of blood components

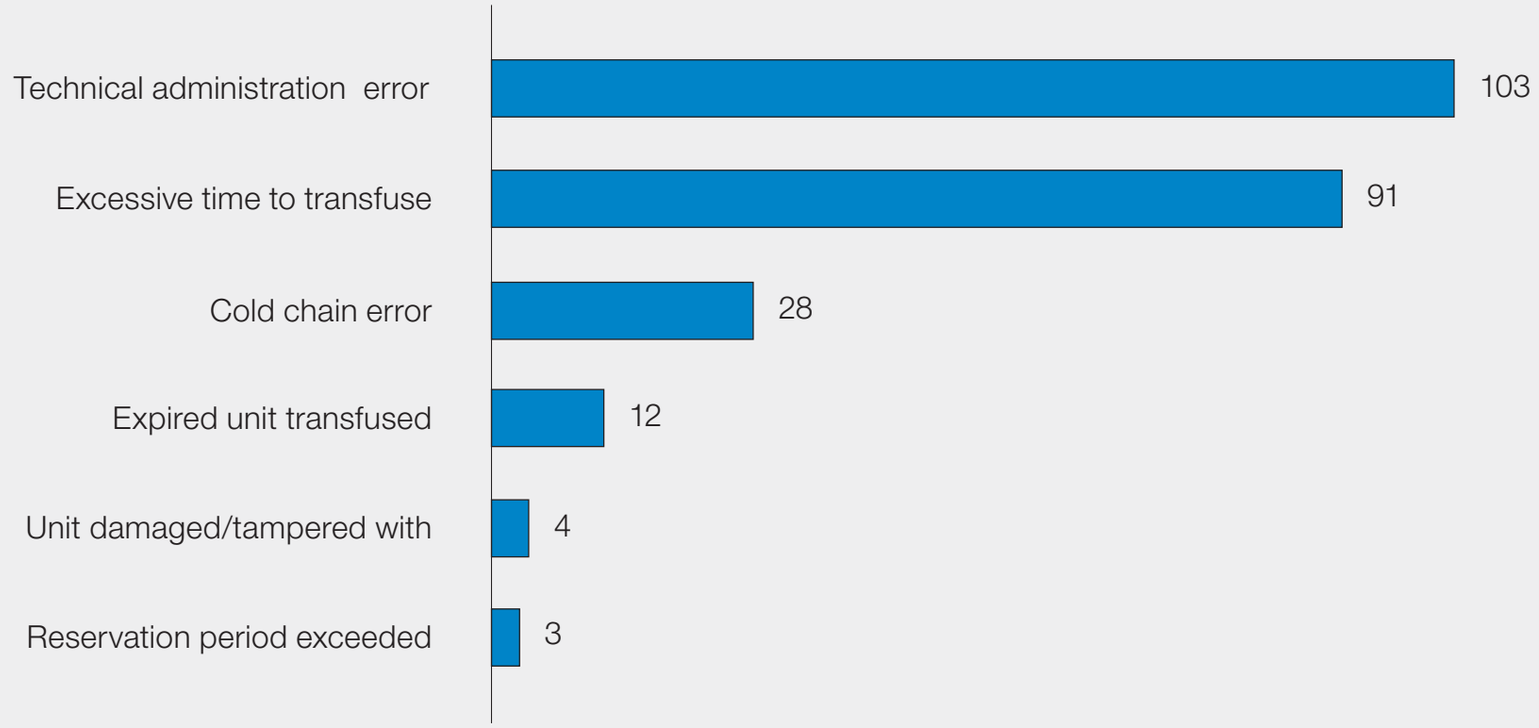
### Organisational pressures

Organisational pressures, 27/221 (12.2%), lack of team function, 23/221 (10.4%), and the working environment, 13/221 (5.9%) all contributed to errors

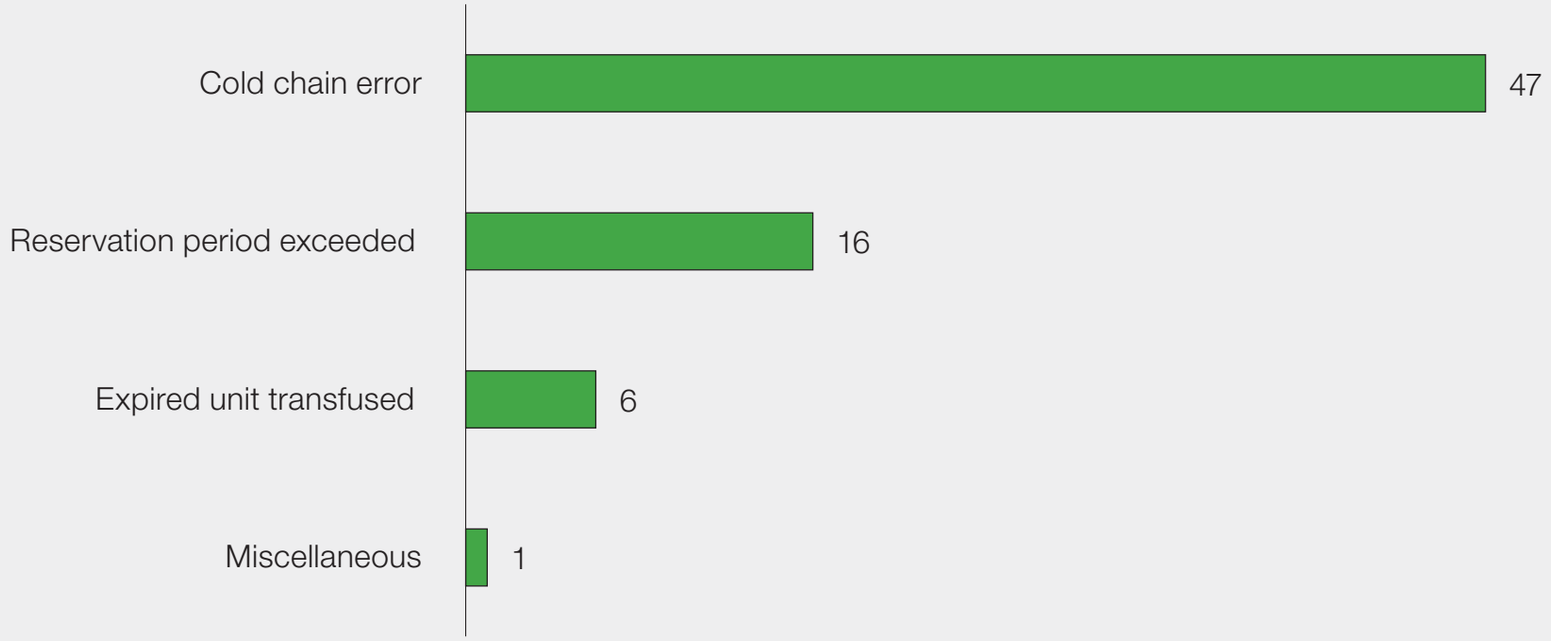
## Figure 10.1: Breakdown of 2024 handling and storage error (HSE) reports (n=311)



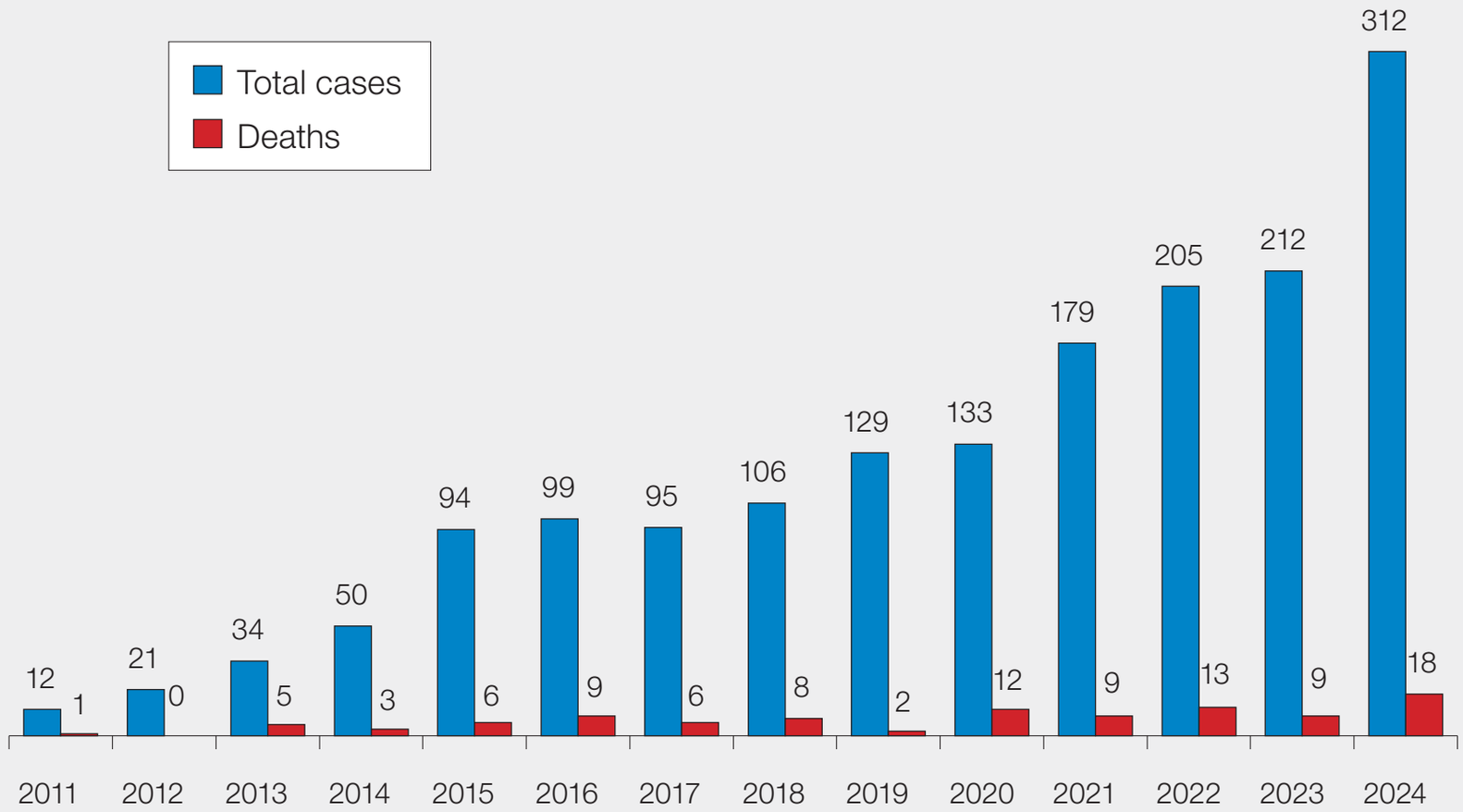
## Figure 10.2: Breakdown of clinical HSE by category in 2024 (n=241)



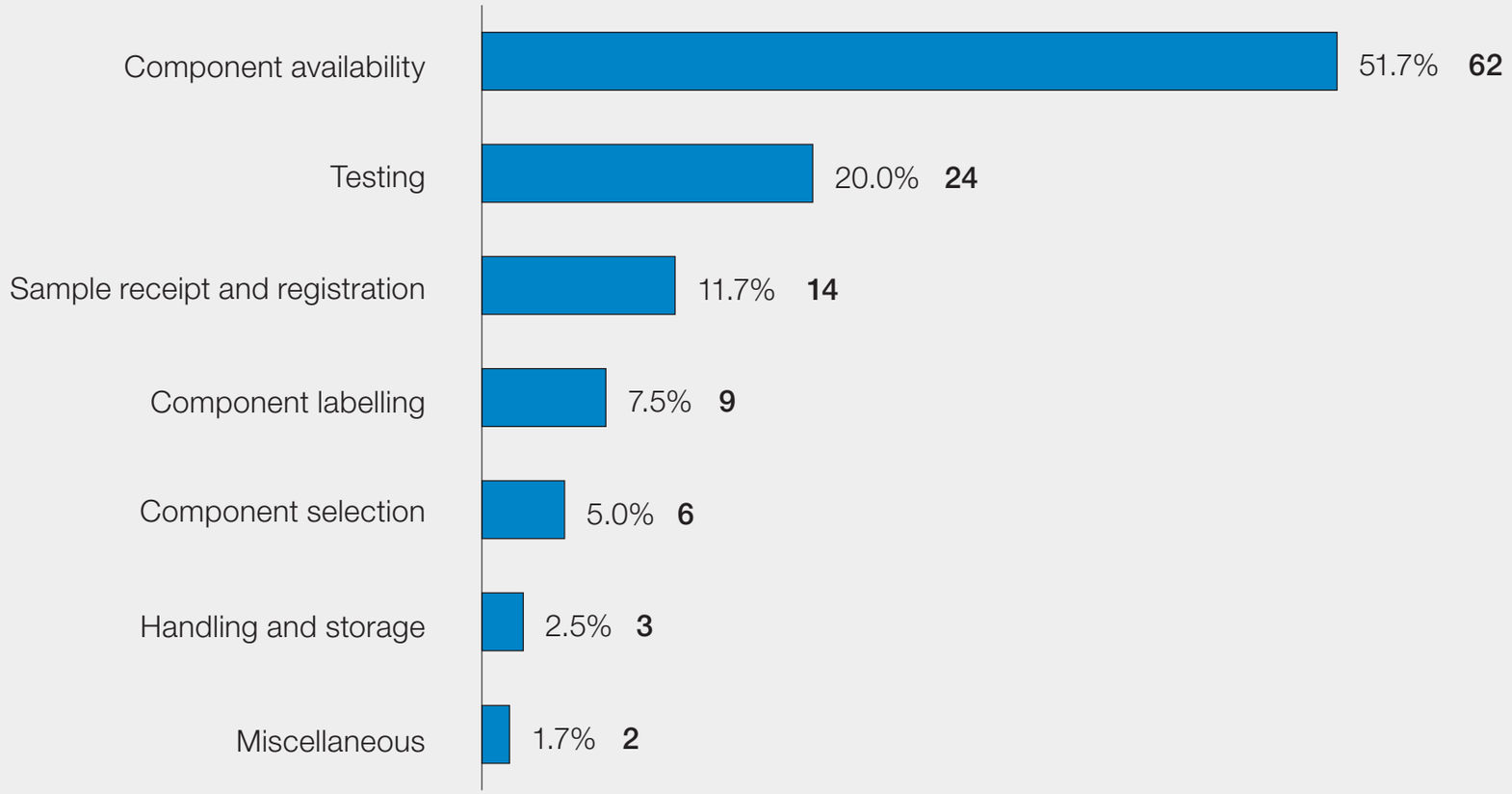
## Figure 10.3: Breakdown of laboratory HSE by category in 2024 (n=70)



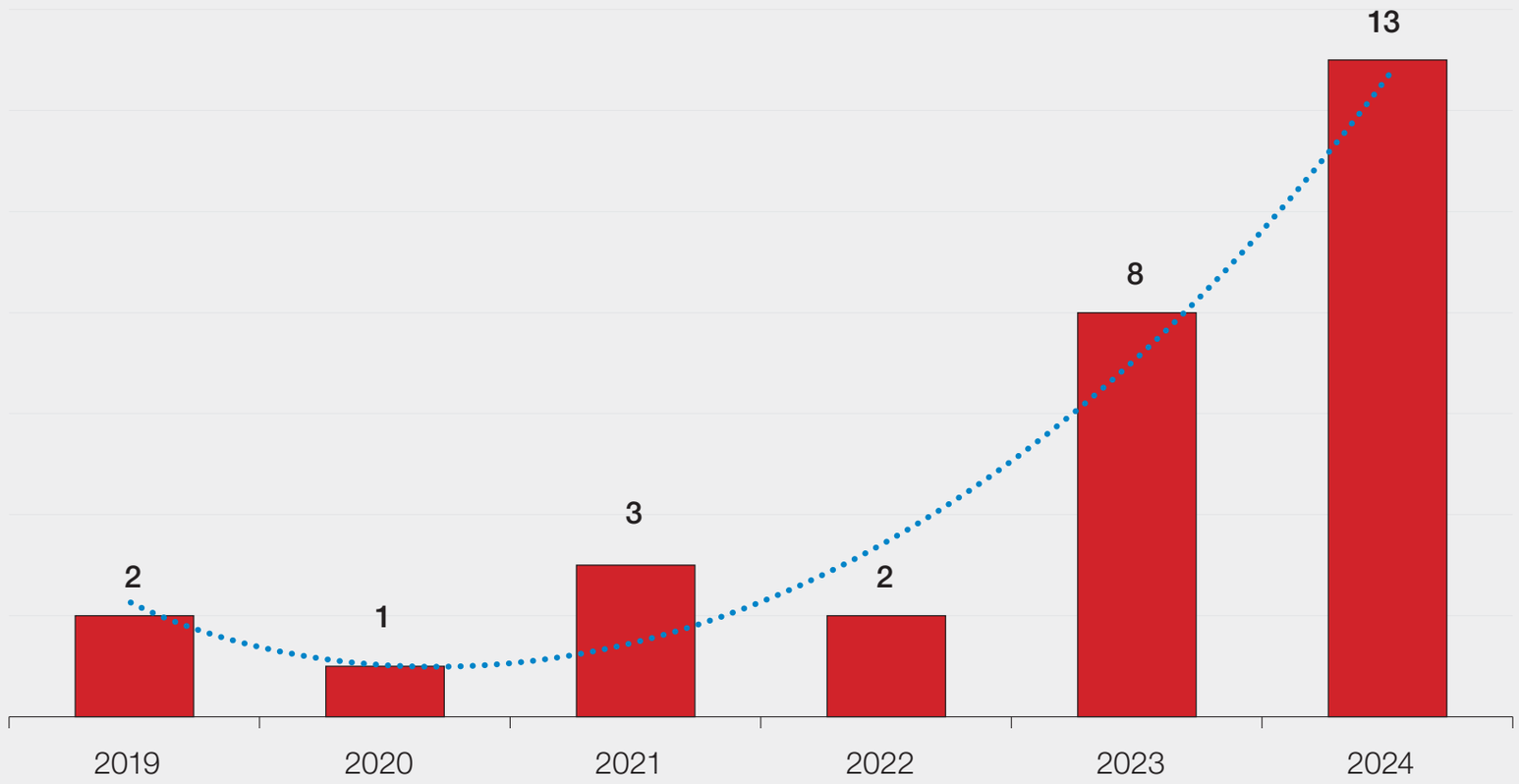
## Figure 11.1: Delayed transfusions by year 2011-2024



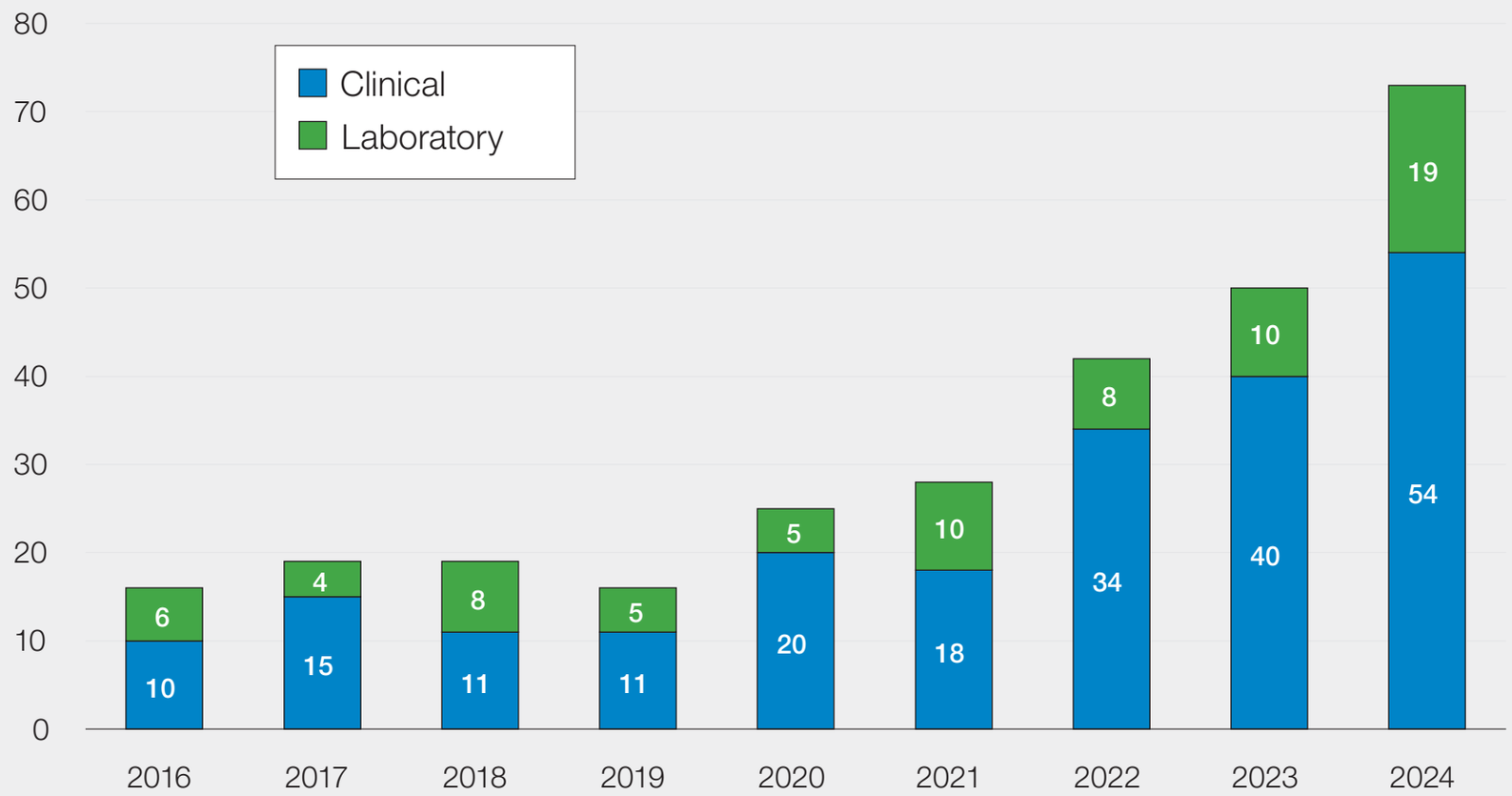
## Figure 11.2: Transfusion process step where laboratory errors occurred resulting in transfusion delays in 2024 (n=120)



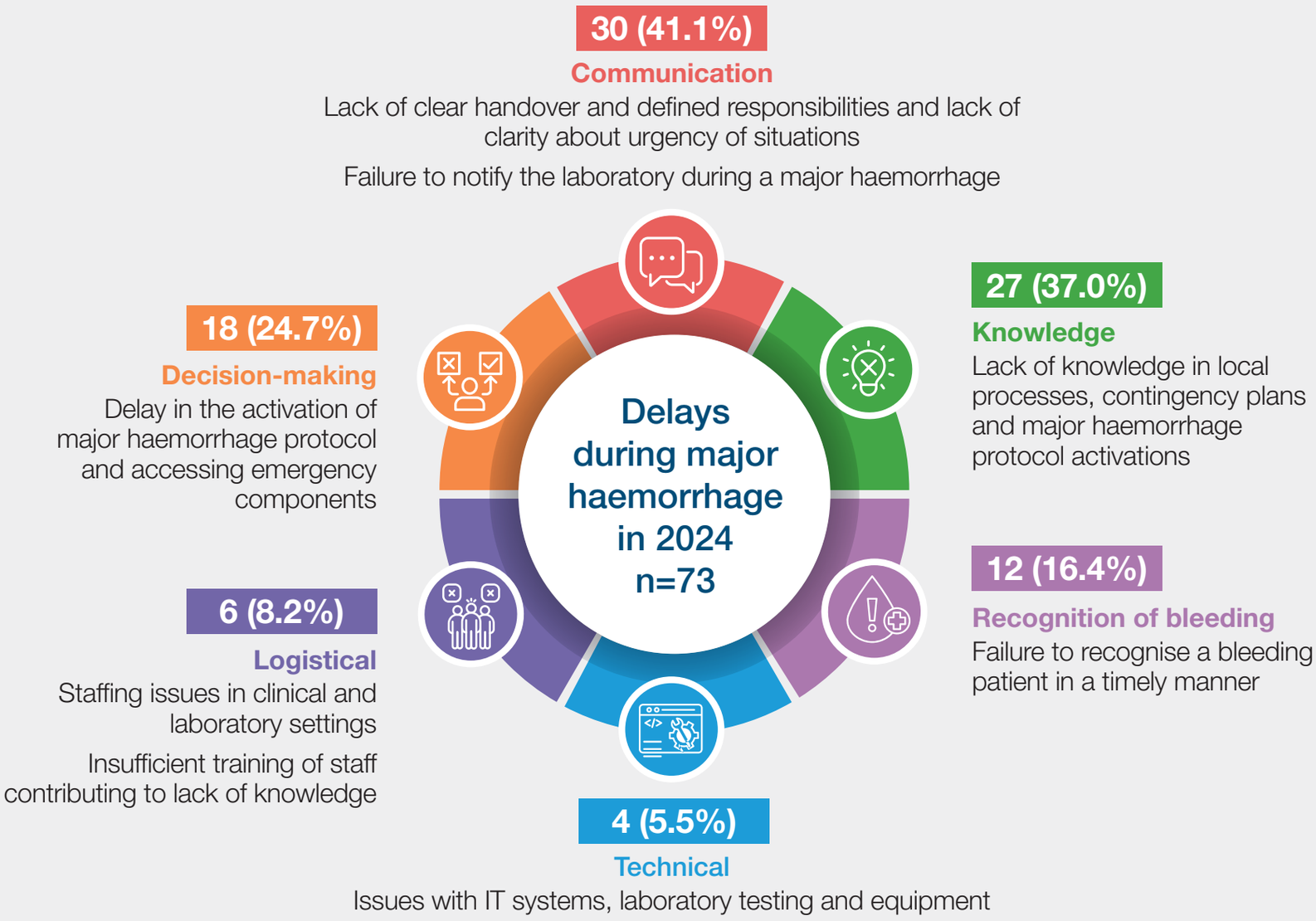
## Figure 11.3: Trend in Blood Service-related errors 2019-2024



## Figure 11.4: Delays associated with MHP 2016-2024

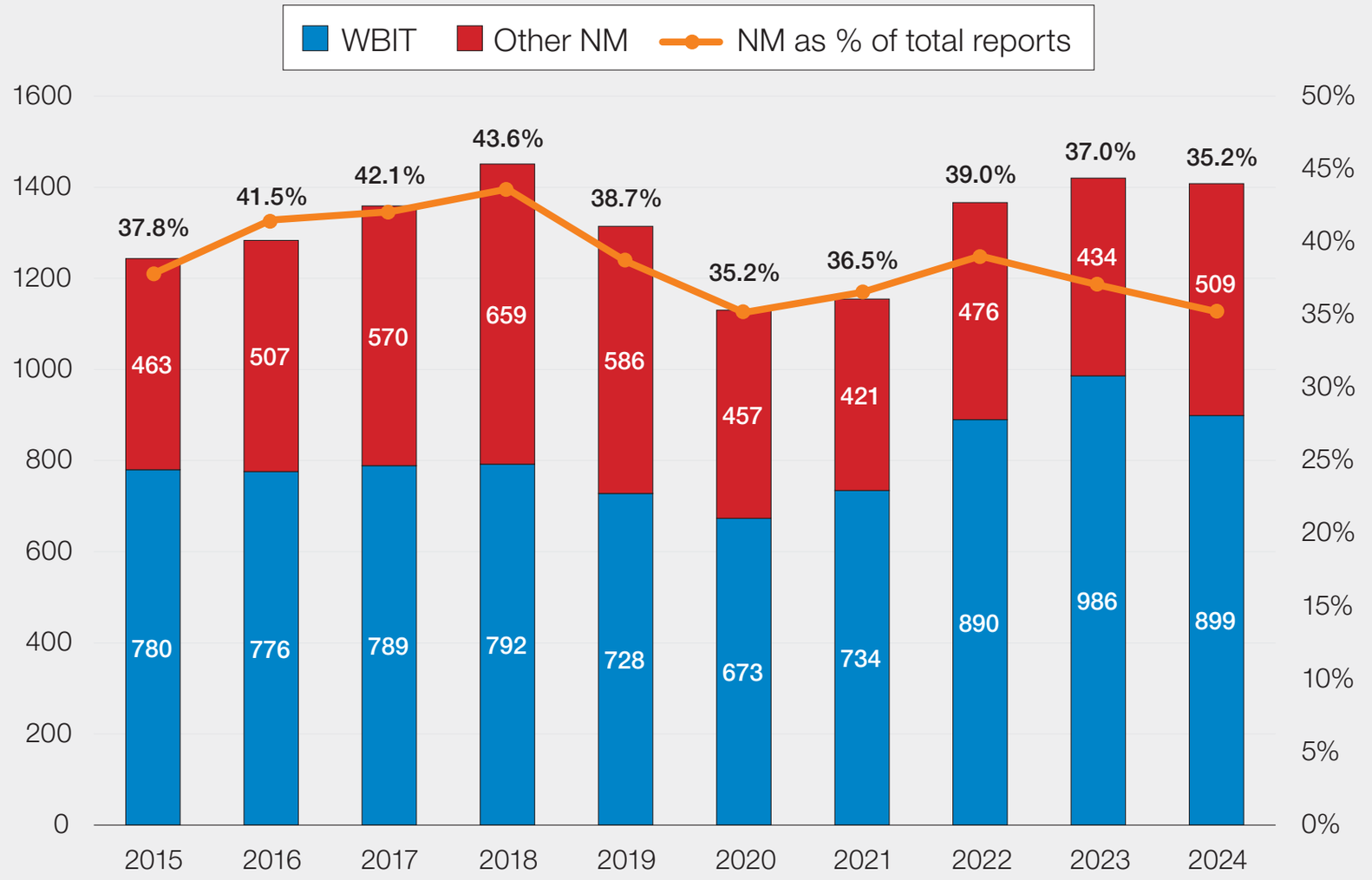


## Figure 11.5: An image depicting the multiple contributing factors that resulted in delays during major haemorrhage in 2024 (n=73)



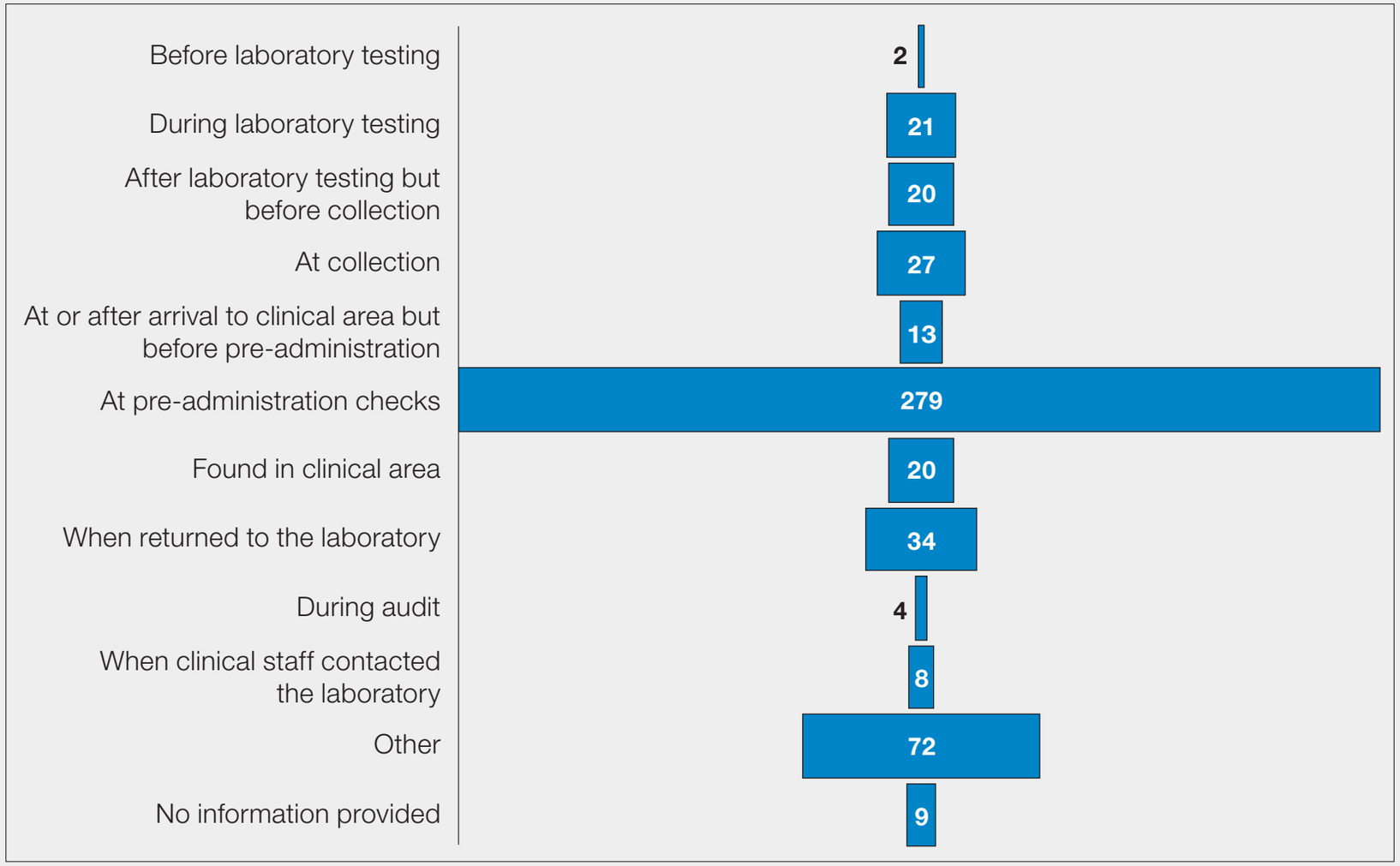

*IT=information technology; MH=major haemorrhage; MHP=major haemorrhage protocol*

## Figure 15.1: A decade of NM (other) and WBIT reports (2015-2024)

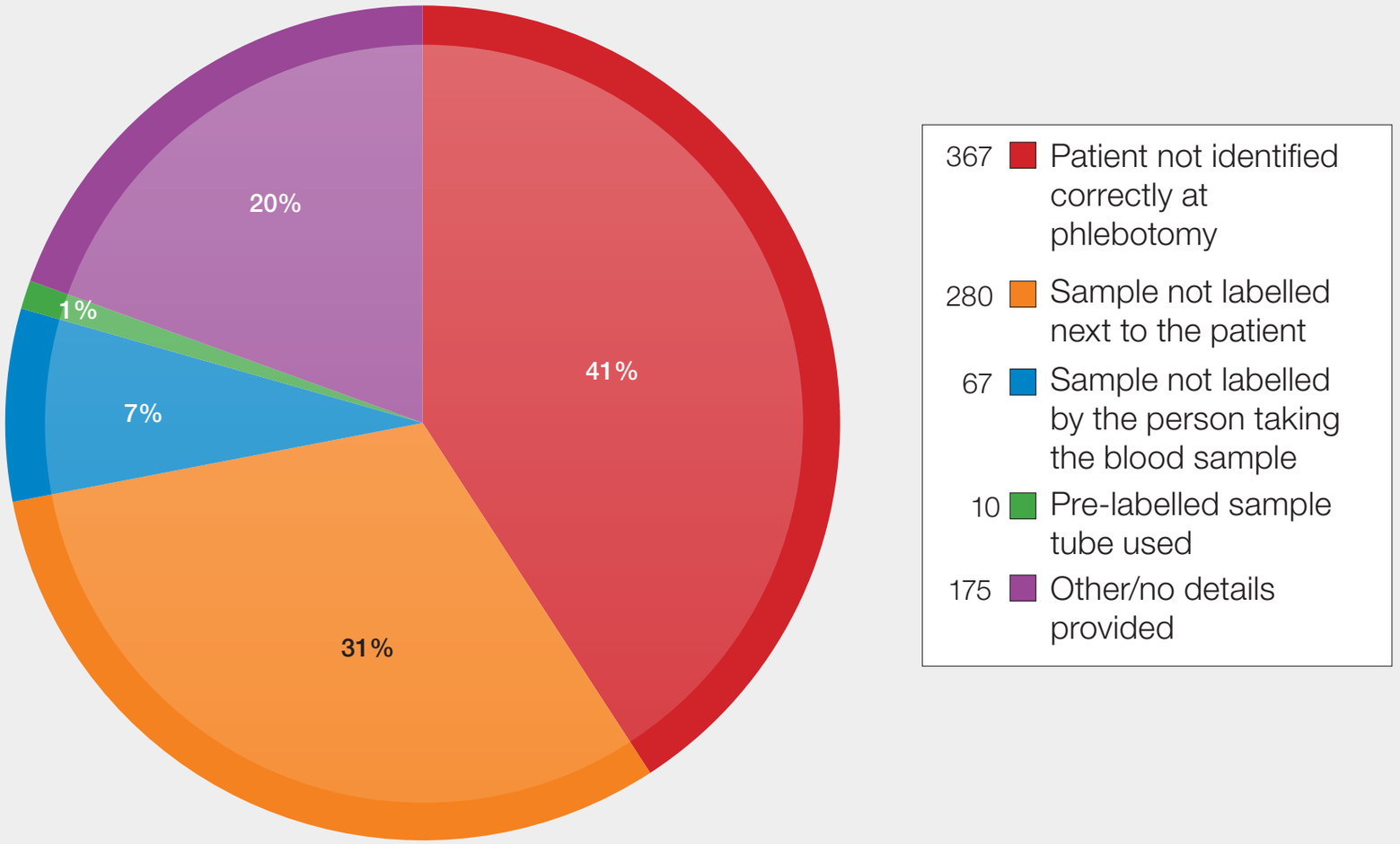



*NM=near miss; WBIT=wrong blood in tube*

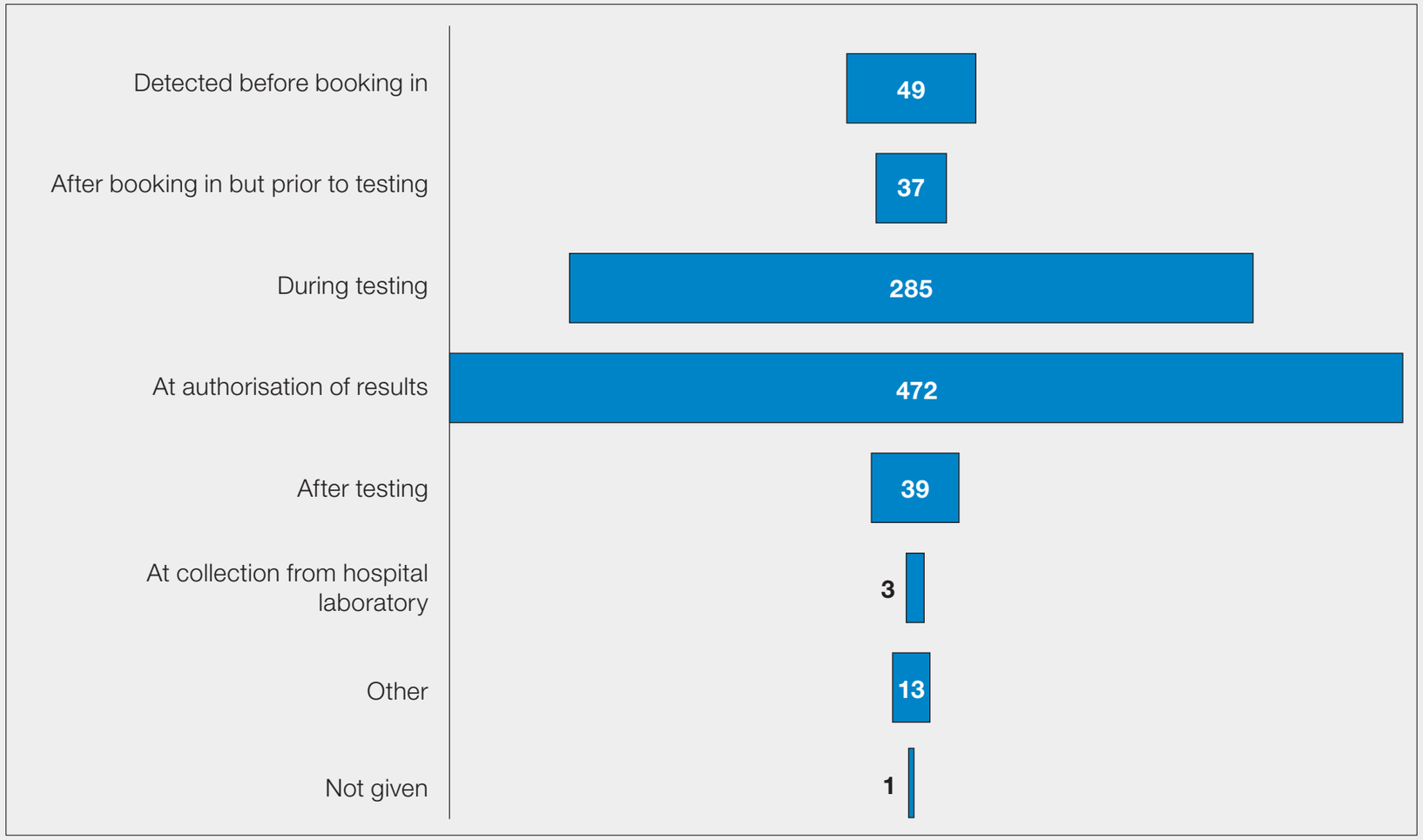
## Figure 15.2: Point in the process where the error was detected in NM events, excluding NM-WBIT reported in 2024 (n=509)



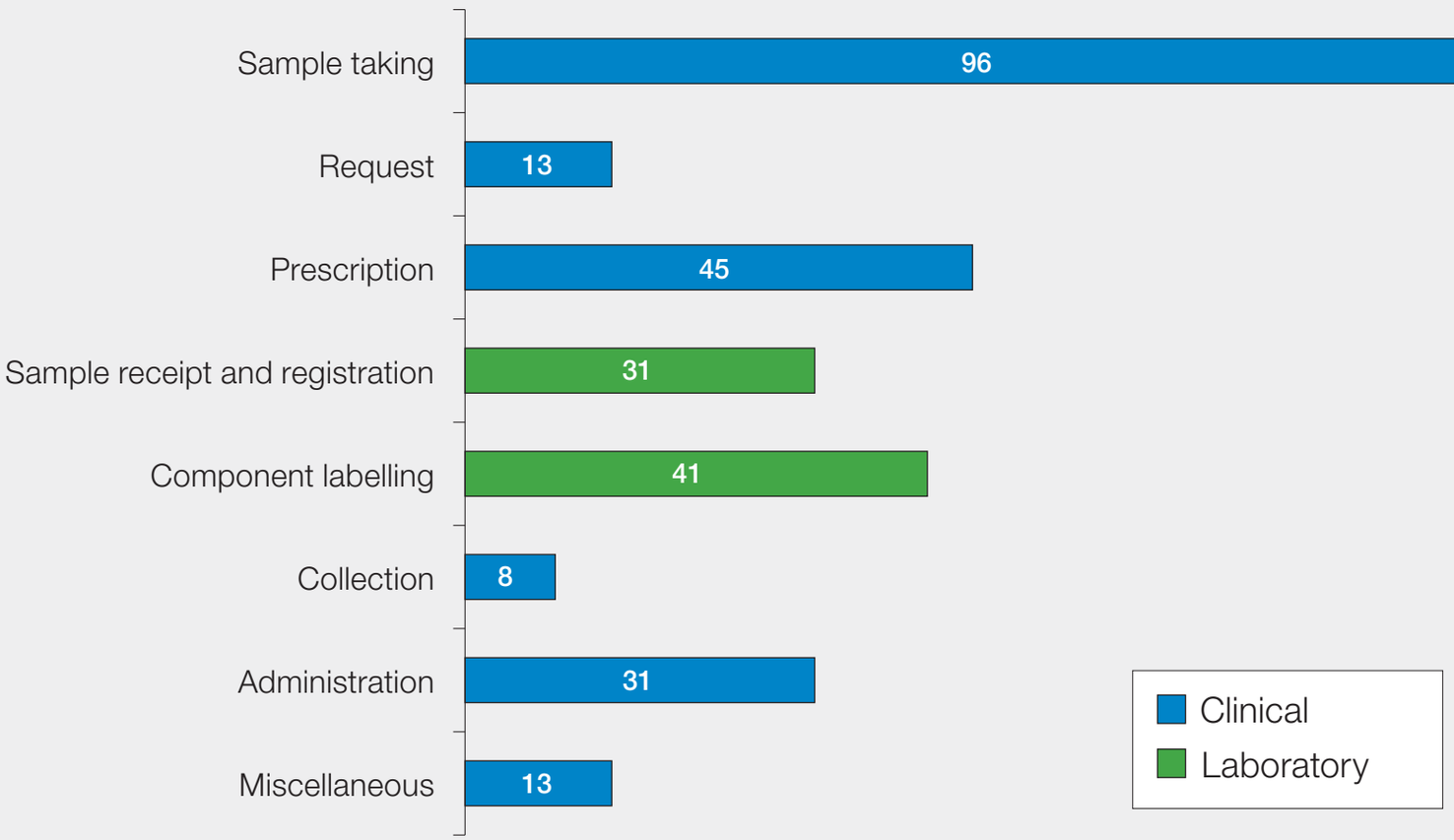
## Figure 15a.1: Primary errors leading to WBIT in 2024 (n=899)



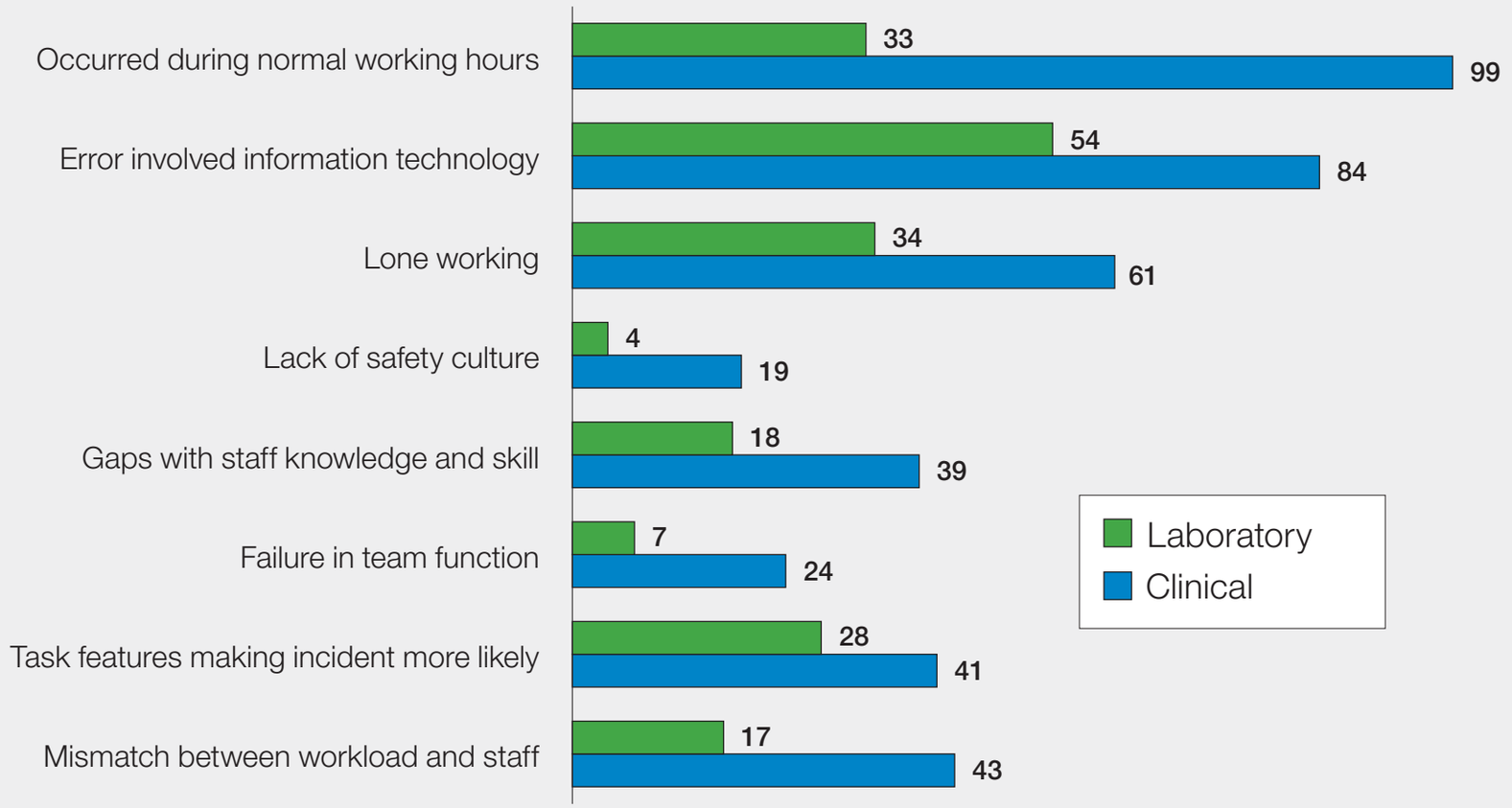
## Figure 15a.2: Point in the process where the error was detected in WBIT reported in 2024 (n=899)



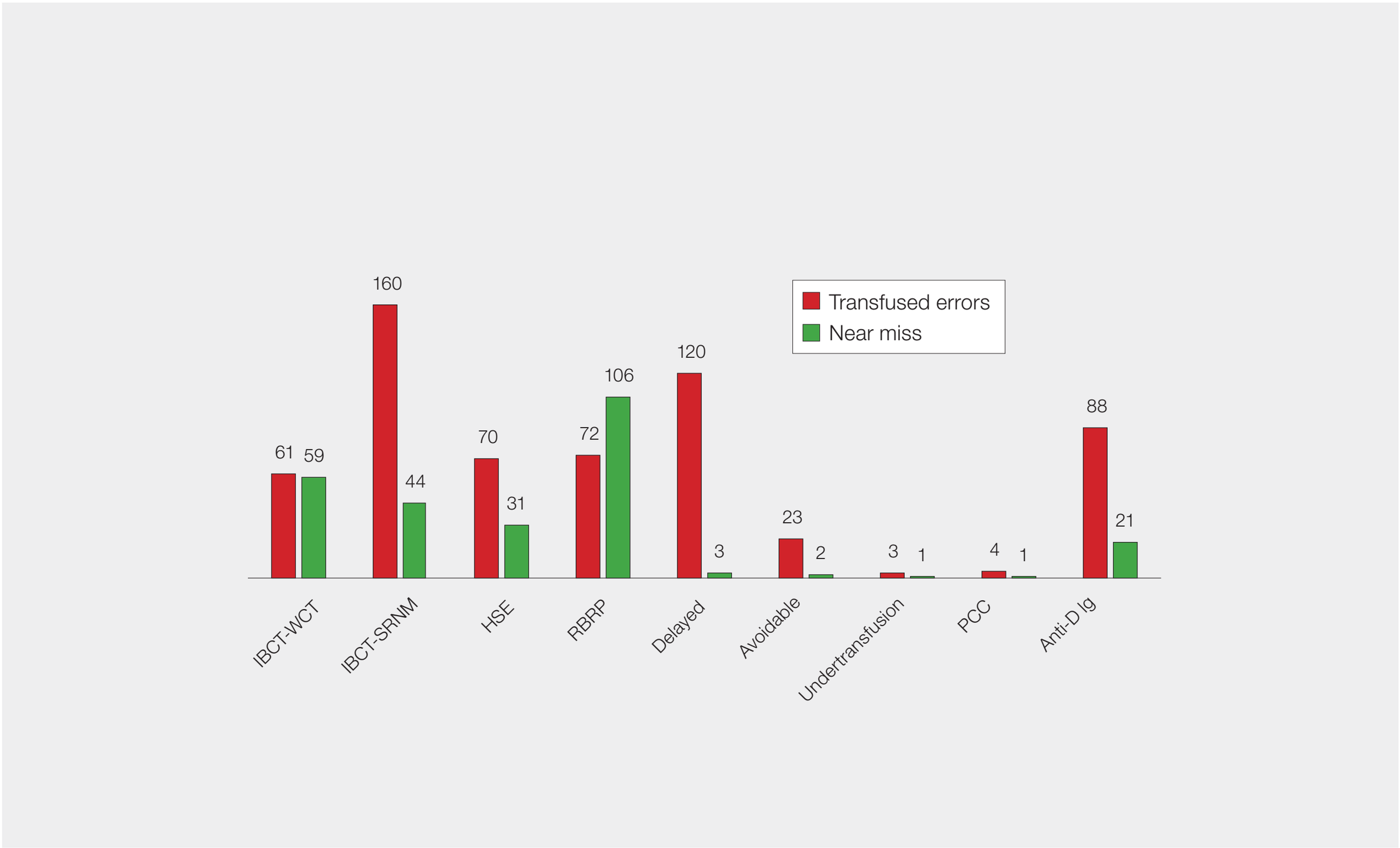
## Figure 16.1: RBRP classified by the step in the transfusion process where the primary error occurred in 2024 (n=278)



## Figure 16.2: Contributory factors in RBRP errors reported in 2024

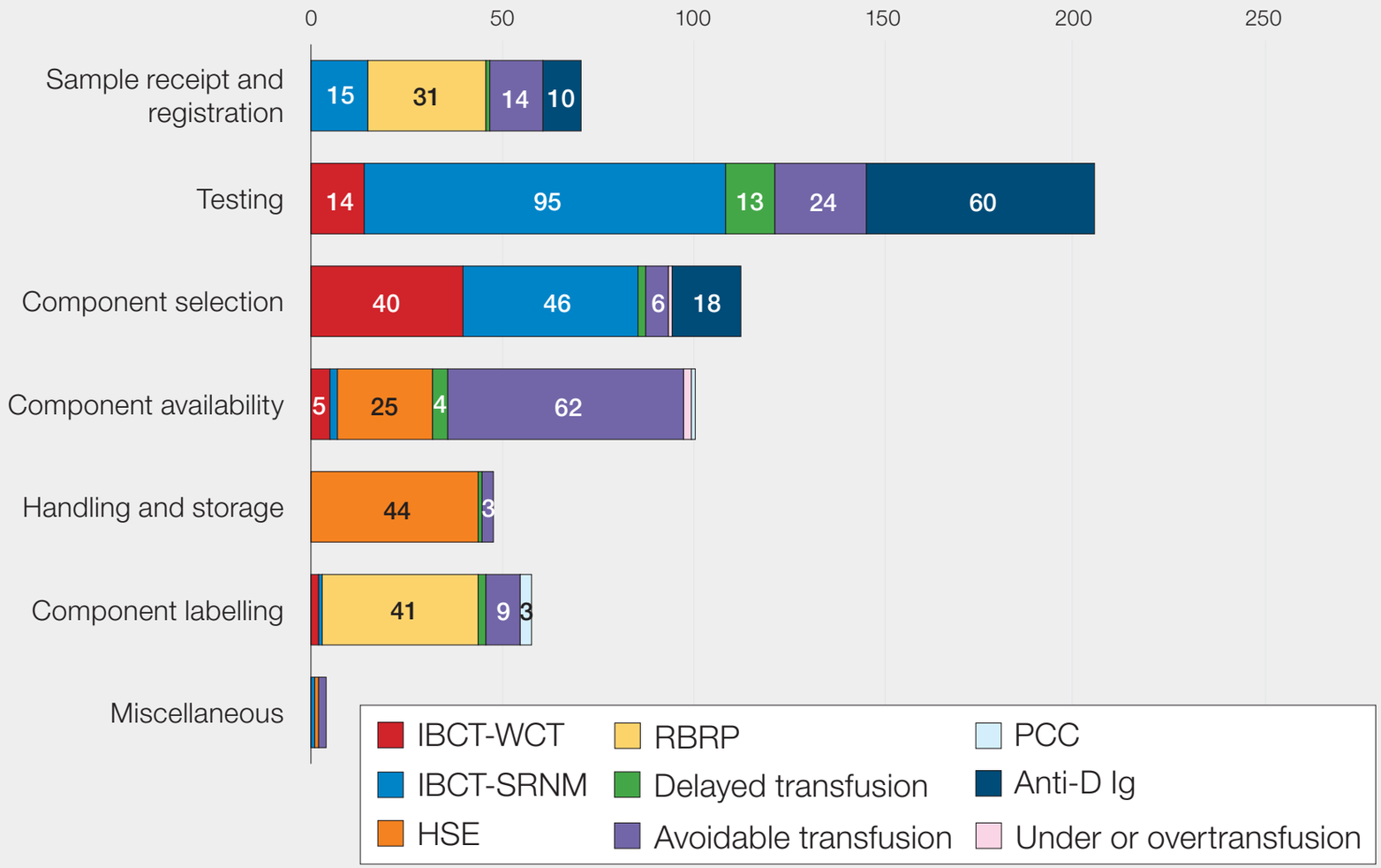


## Figure 17.1: Laboratory errors and near misses in 2024 (n=869)



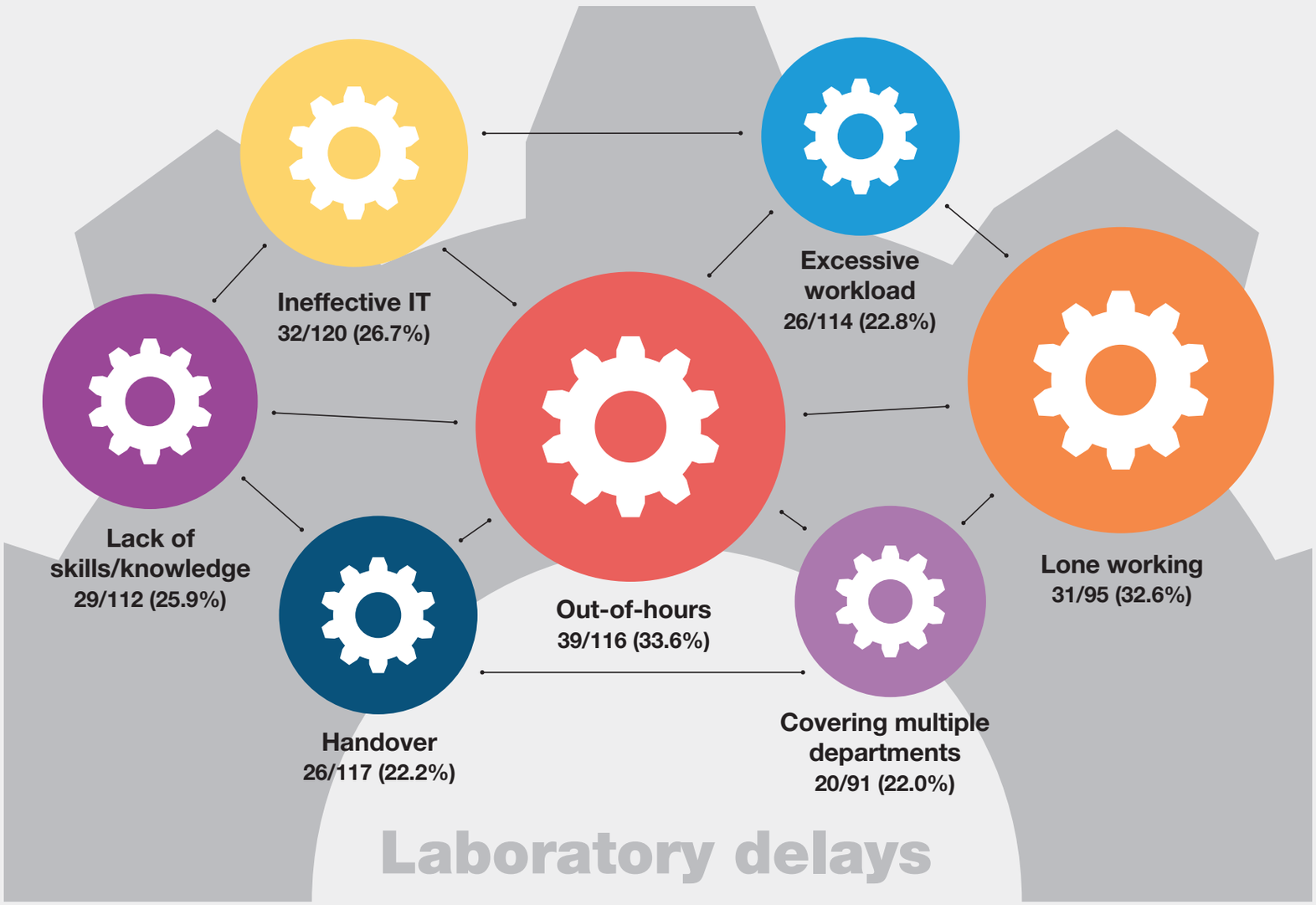

*IBCT-WCT=incorrect blood component transfused-wrong component transfused; IBCT-SRNM=IBCT-specific requirements not met; HSE=handling and storage errors; RBRP=right blood right patient; PCC=prothrombin complex concentrates; Ig=immunoglobulin*

## Figure 17.2: Laboratory errors in 2024, classified by the transfusion step where the primary error occurred (n=601)



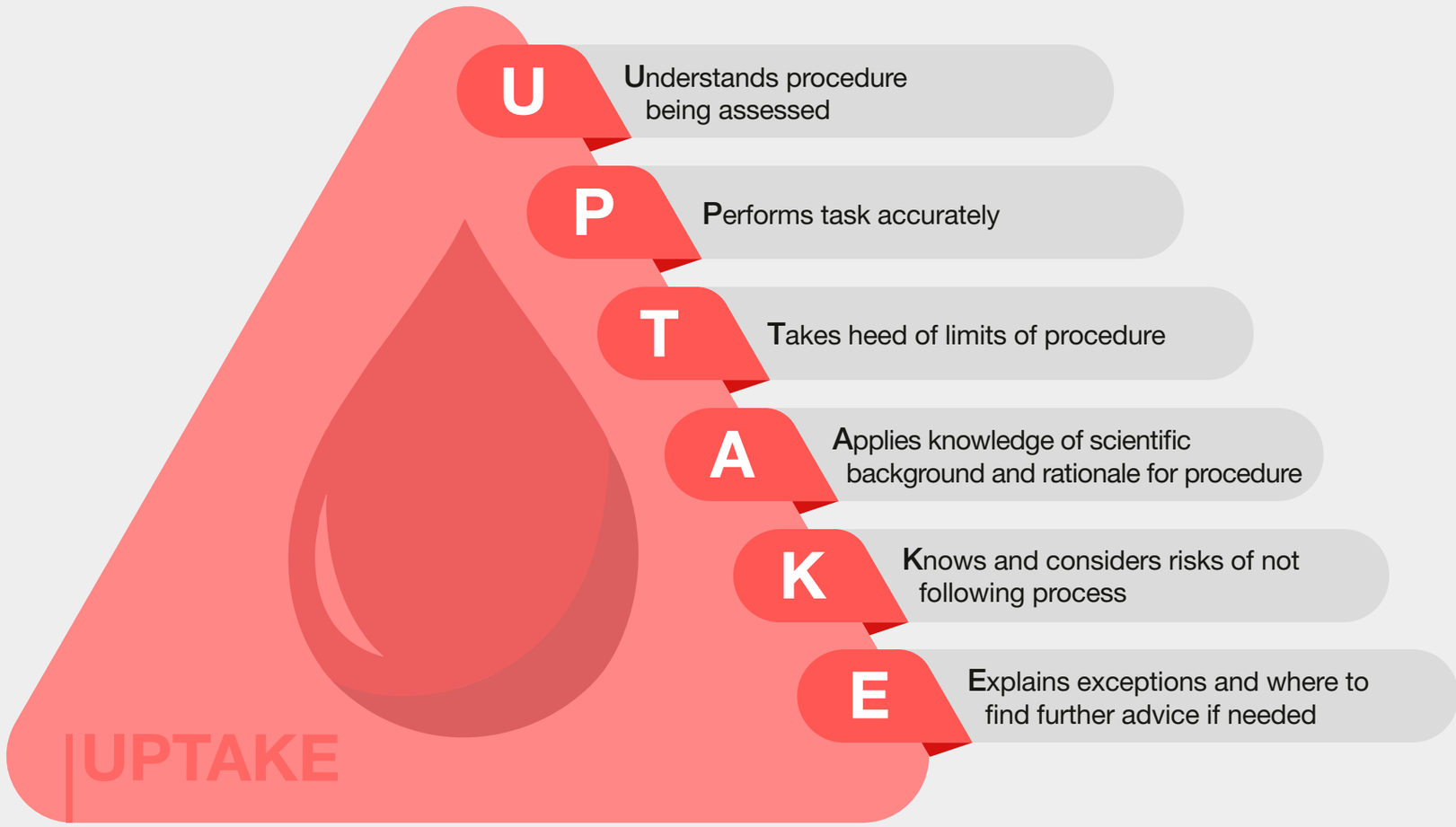

*IBCT-WCT=incorrect blood component transfused-wrong component transfused; IBCT-SRNM=IBCT-specific requirements not met; HSE=handling and storage errors; RBRP=right blood right patient; PCC=prothrombin complex concentrates; Ig=immunoglobulin. Note: numbers <3 are too small to be annotated on the figure*

## Figure 17.3: Factors interacting to contribute to laboratory delays in 2024



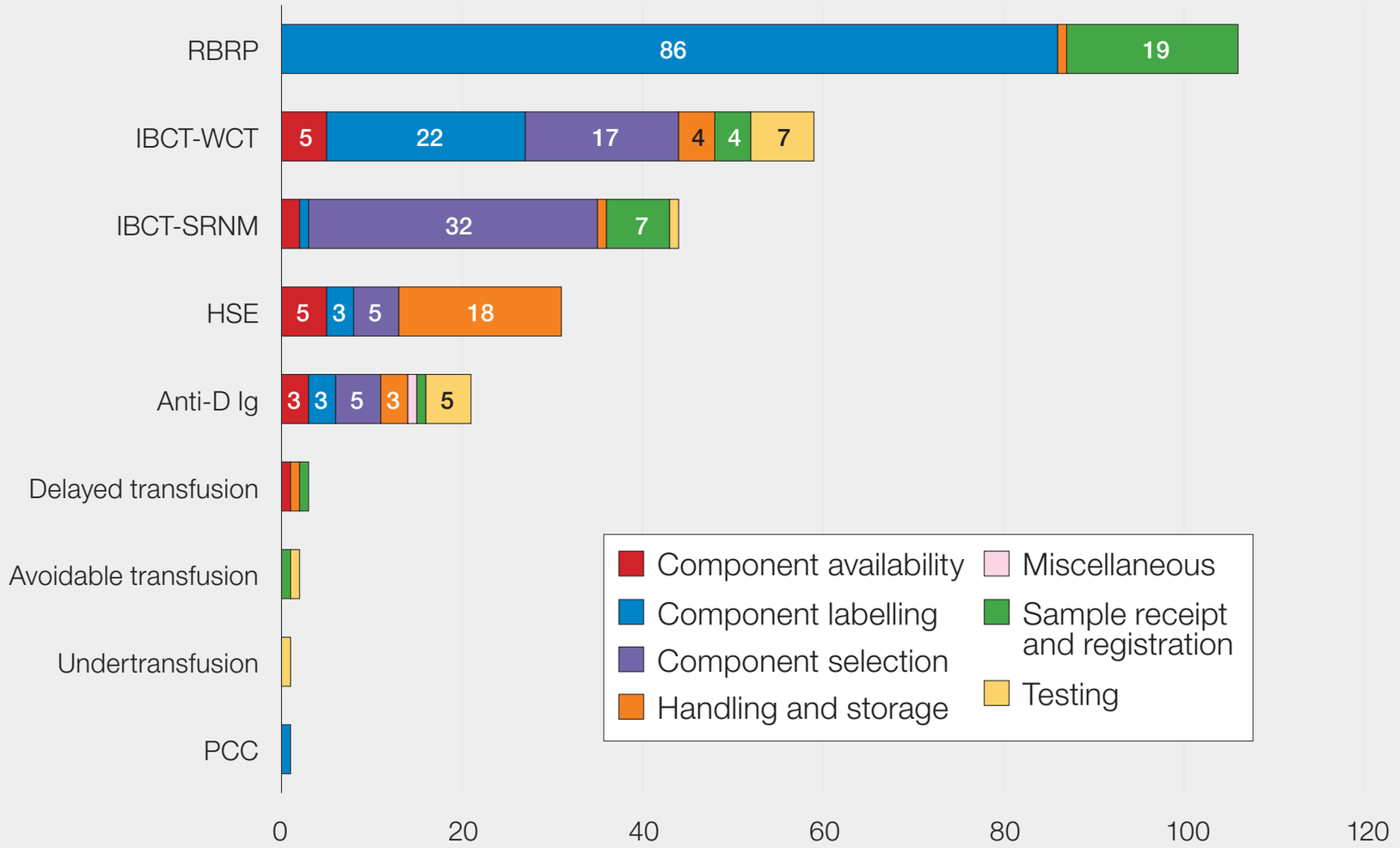

*IT=information technology*

## Figure 17.4: UPTAKE competency assessment model



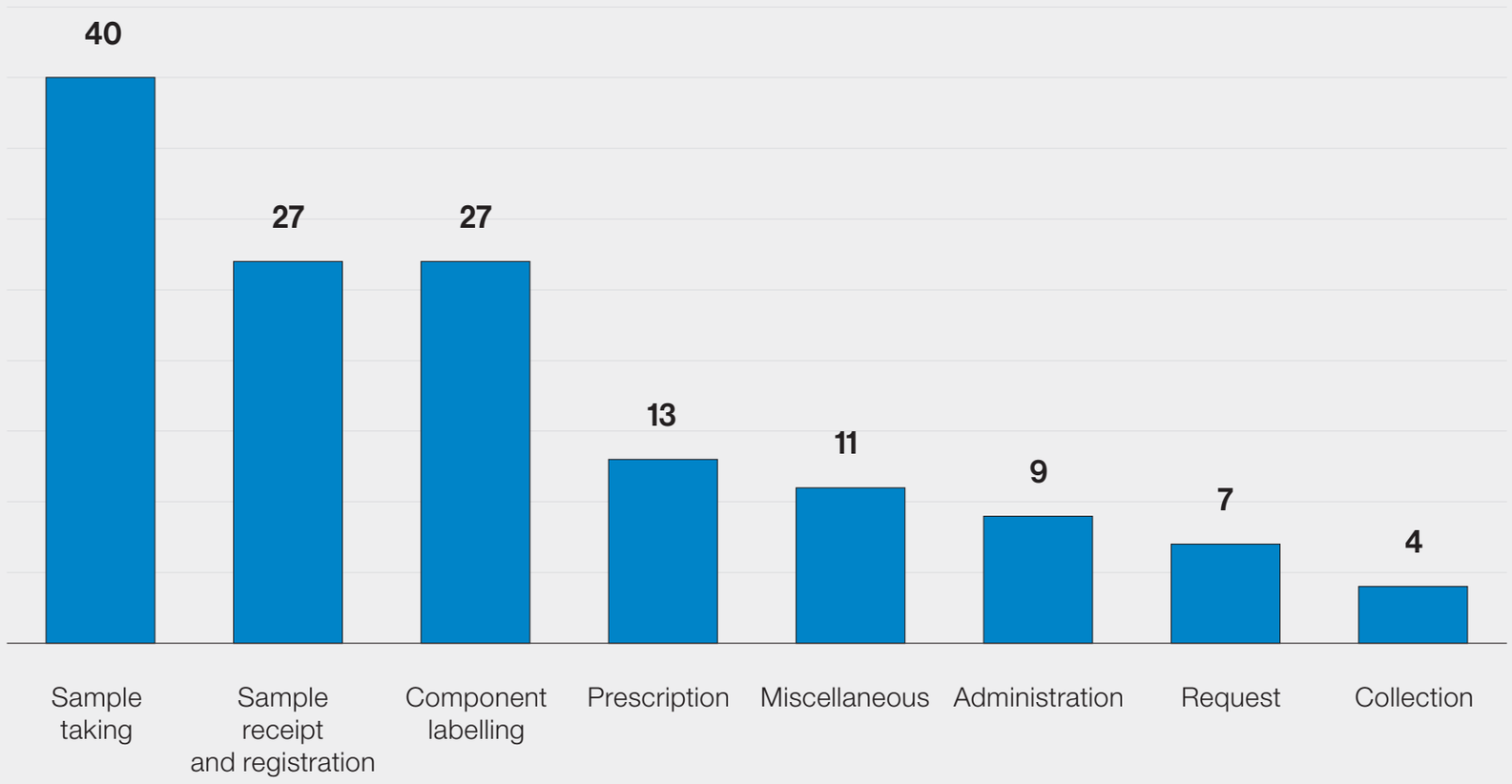

*https://www.shotuk.org/resources/uptake-competency-assessment/*

## Figure 17.5: Laboratory NM classified by the transfusion step where the primary error occurred in 2024 (n=268)

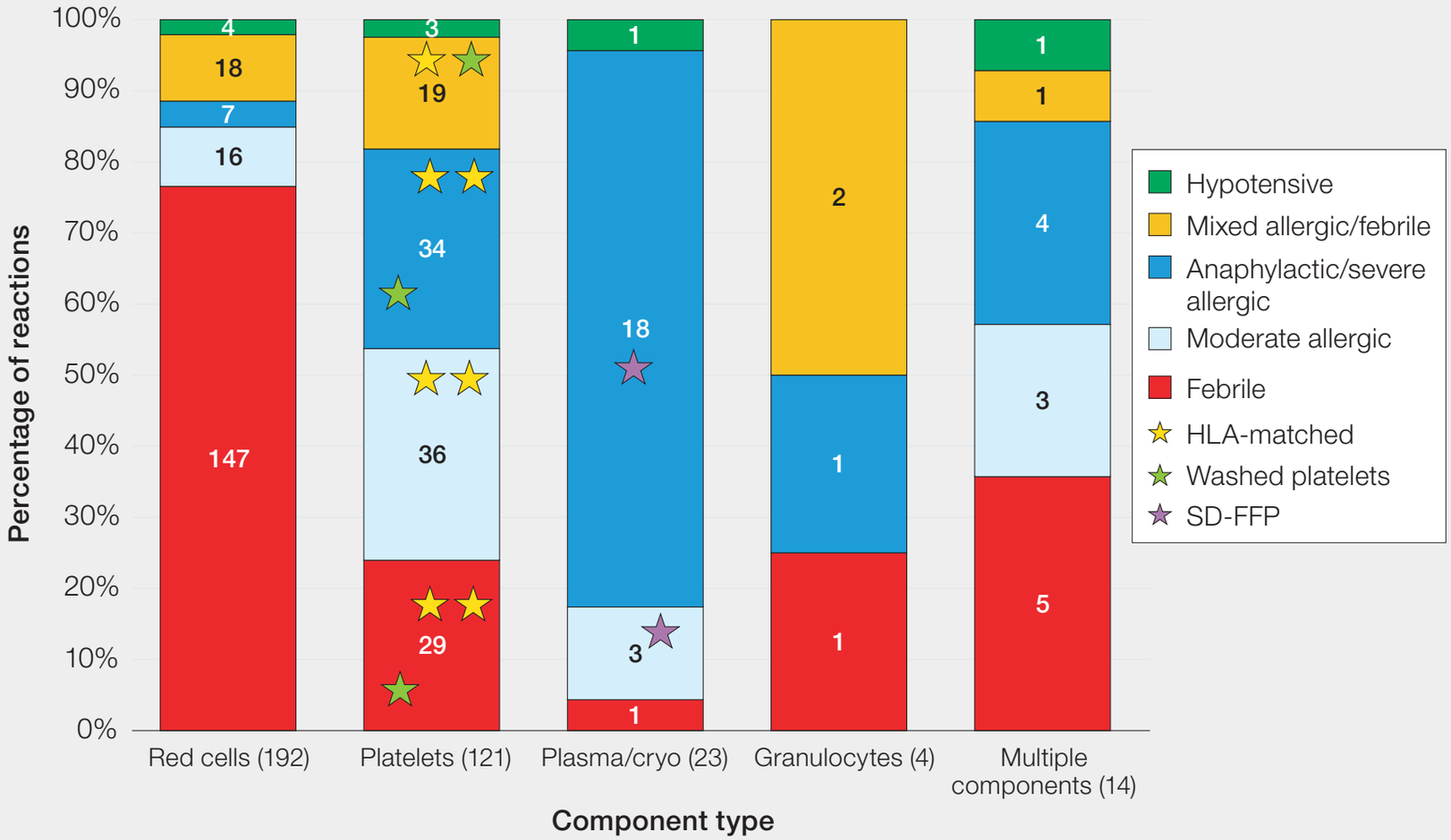



*IBCT-WCT=incorrect blood component transfused-wrong component transfused; IBCT-SRNM=IBCT-specific requirements not met; HSE=handling and storage errors; RBRP=right blood right patient; PCC=prothrombin complex concentrates; Ig=immunoglobulin. Note: numbers <3 are too small to be annotated on the figure*

Figure 18.1: RBRP IT-related errors according to the step in the transfusion process in 2024 (n=138)

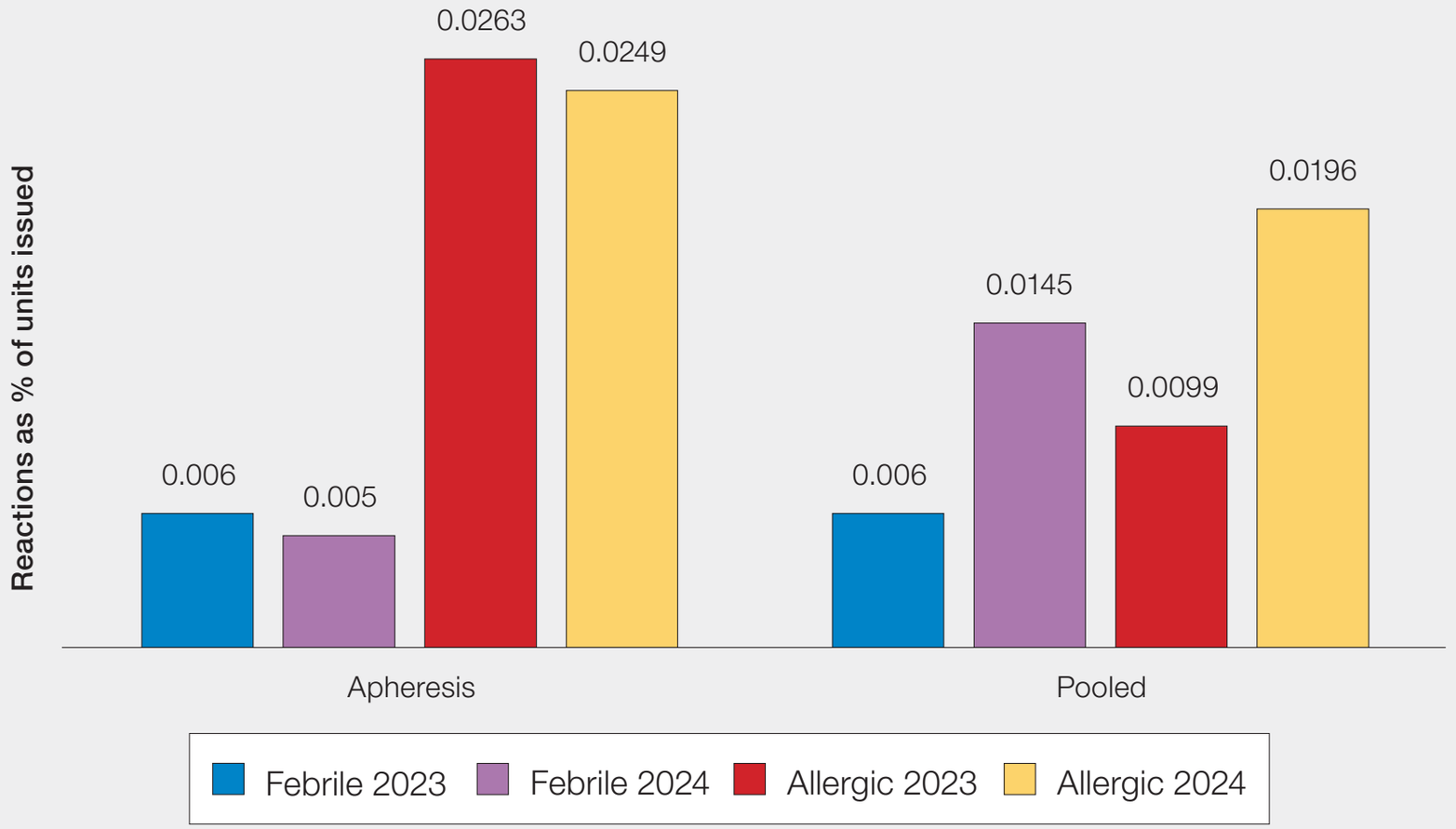


## Figure 19.1: FAHR reactions by component type in 2024 (n=354)




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

## Figure 19.2: Incidence of platelet reactions as a percentage of units issued 2023-2024



# Figure 20a.1: Updated 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), left ventricular dysfunction, aortic stenosis, or any other heart valve disease | | |
| | 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 a low serum albumin level? | | |
| | 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 red cell transfusion: ensure appropriate indication and volume is prescribed (adults)**

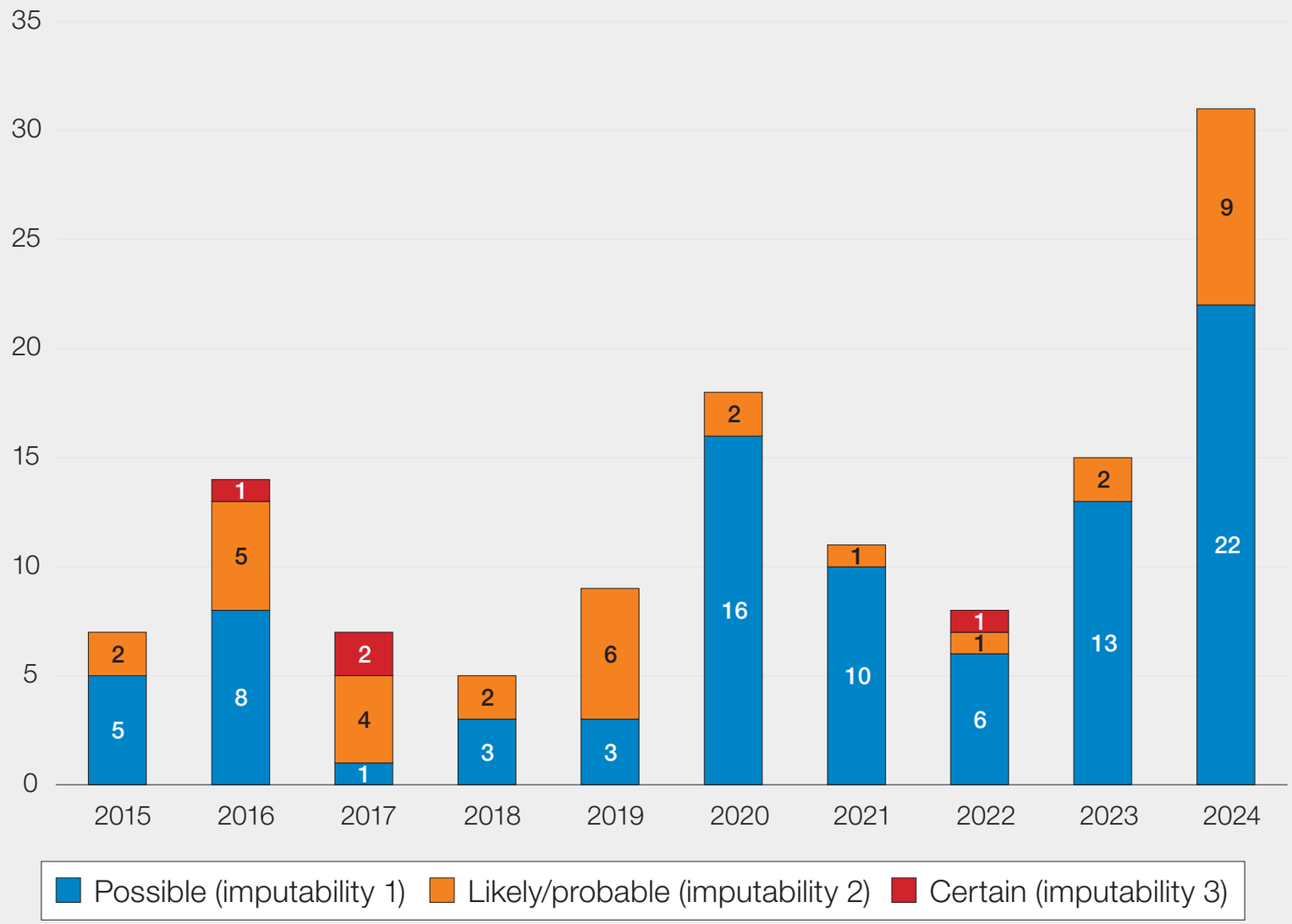
| Indication code for transfusion | Target Hb | Dosing advice |
|---|---|---|
| Acute anaemia (R2) | Post-transfusion target Hb 70 - 90g/L | Body weight dosing (max 2 units) |
| Acute anaemia (R3: with acute MI/ACS) | Post-transfusion target Hb 80 - 100g/L | Body weight dosing (max 2 units) |
| Severe symptomatic chronic anaemia (R7) | No target Hb - minimum transfusion | Usually single unit only |
| Regular transfusion programme (R4) | Individualised target Hb | Body weight dosing (max 2 units) |

| Other measures to mitigate TACO: ASSIGN ACTION AS APPROPRIATE | TICK |
|---|---|
| Review patient after each unit (red cells) and review symptoms of anaemia. Is further transfusion necessary? | |
| Measure the fluid balance | |
| Consider a prophylactic diuretic (where appropriate/not contraindicated) | |
| Monitor the vital signs closely, including oxygen saturation | |

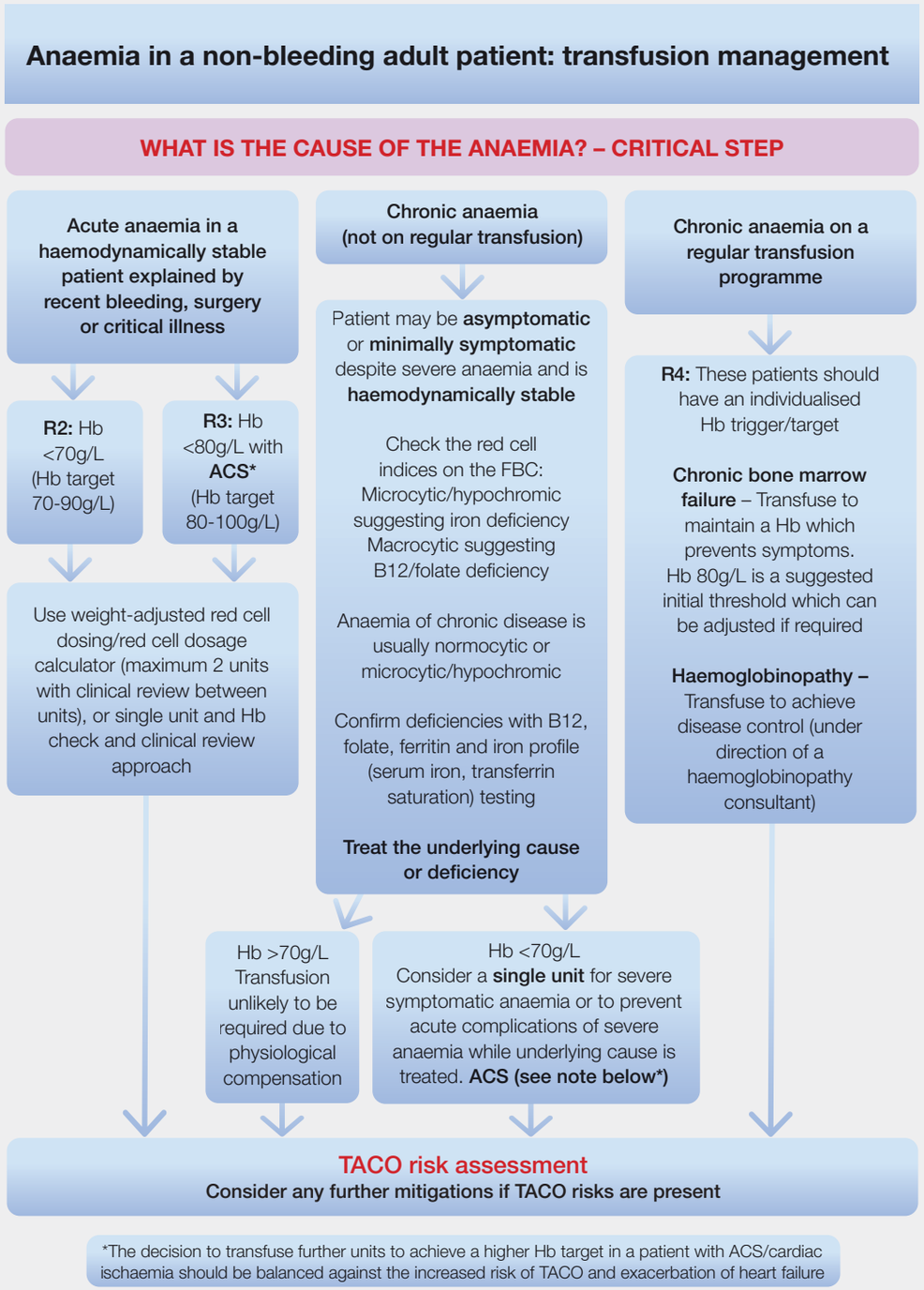
| | |
|---|---|
| **Name (PRINT):** | **Due to the differences in adult and neonatal physiology, babies may have a different risk for TACO. Calculate the dose by weight and observe the notes above.** |
| **Role:** | |
| **Date:** **Time (24hr):** | |
| **Signature:** | |

TACO=transfusion-associated circulatory overload; MI=myocardial infarction; ACS=acute coronary syndrome; Hb=haemoglobin

## Figure 20a.2: TACO-related deaths with imputability, 2015 to 2024 (n=125)



# Figure 20a.3: Transfusion management of a non-bleeding adult patient – identification of the cause of anaemia




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

## Figure 21.1: Age range in males and females experiencing a HTR in 2024

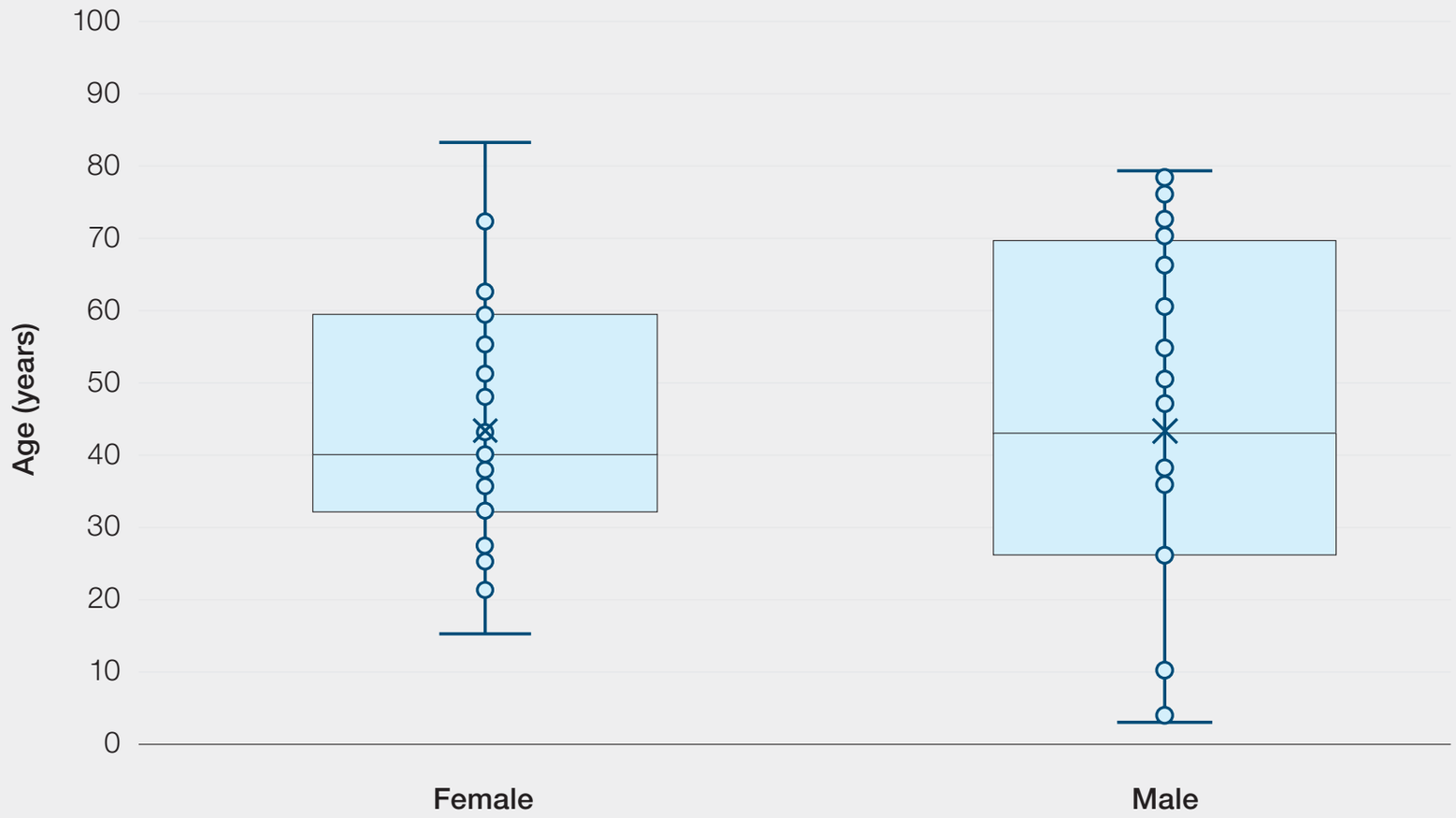
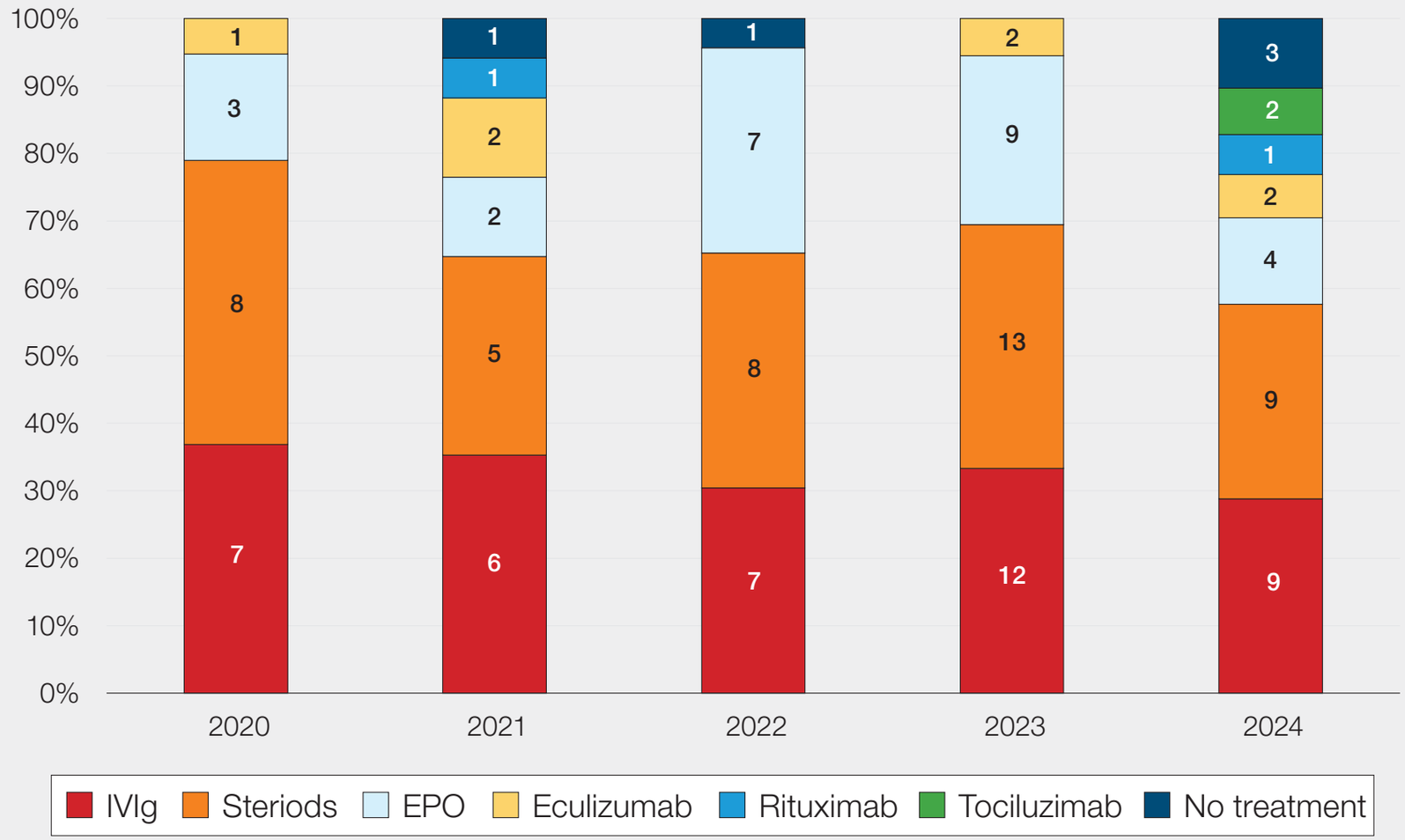



*Figure 21.1 is a box and whisker diagram showing the median age and the age range of patients experiencing a HTR reported to SHOT separated by gender. The middle bar in the shaded box indicates the median age, the outer bars of the box represent the upper and lower quartiles. The lines extending from the boxes (whiskers) indicate the lowest and highest values.*

## Figure 21.2: Treatments used to manage hyperhaemolysis (2020-2024)



## Figure 21.3: Antibodies implicated in AHTR in 2024

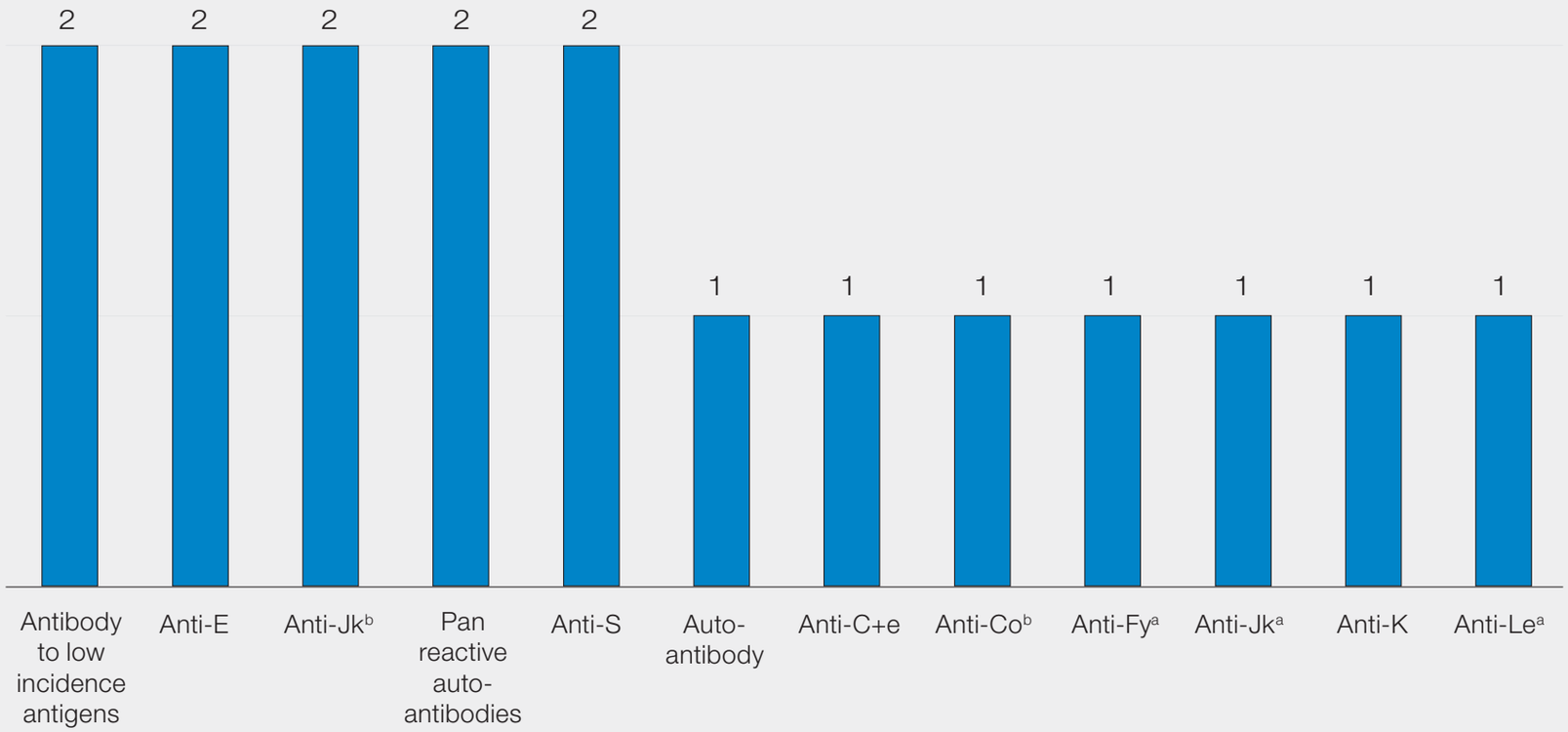
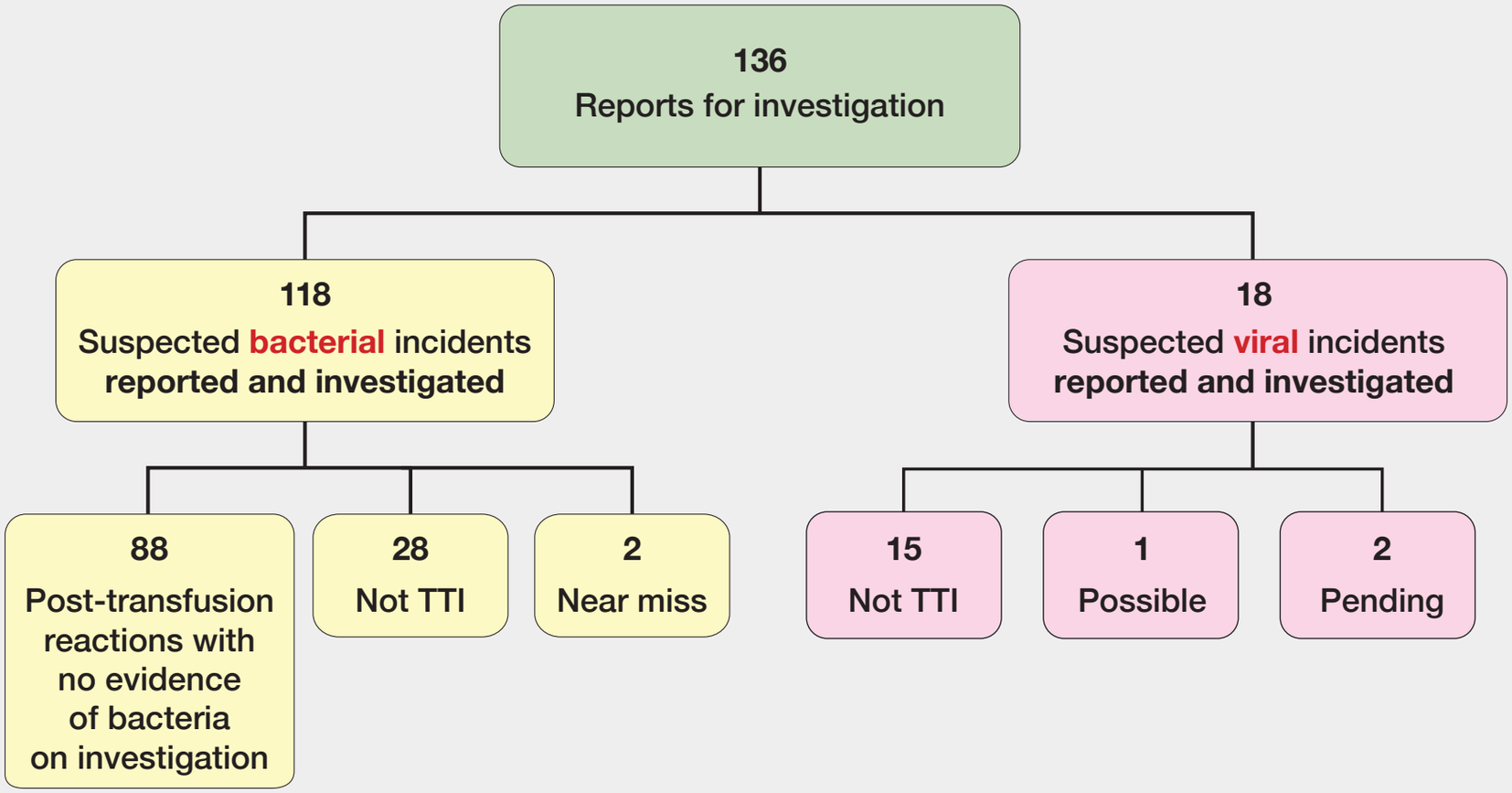
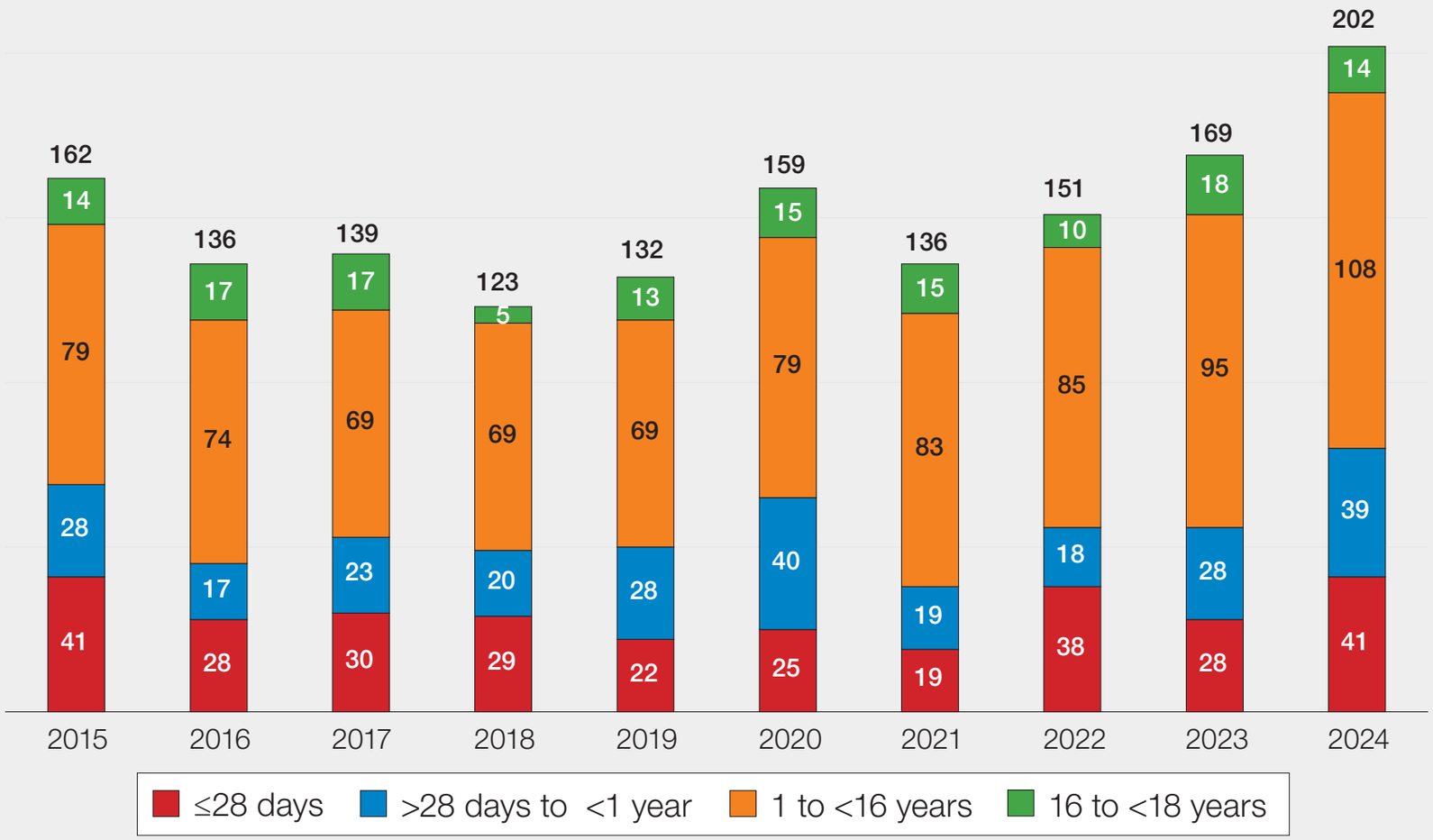


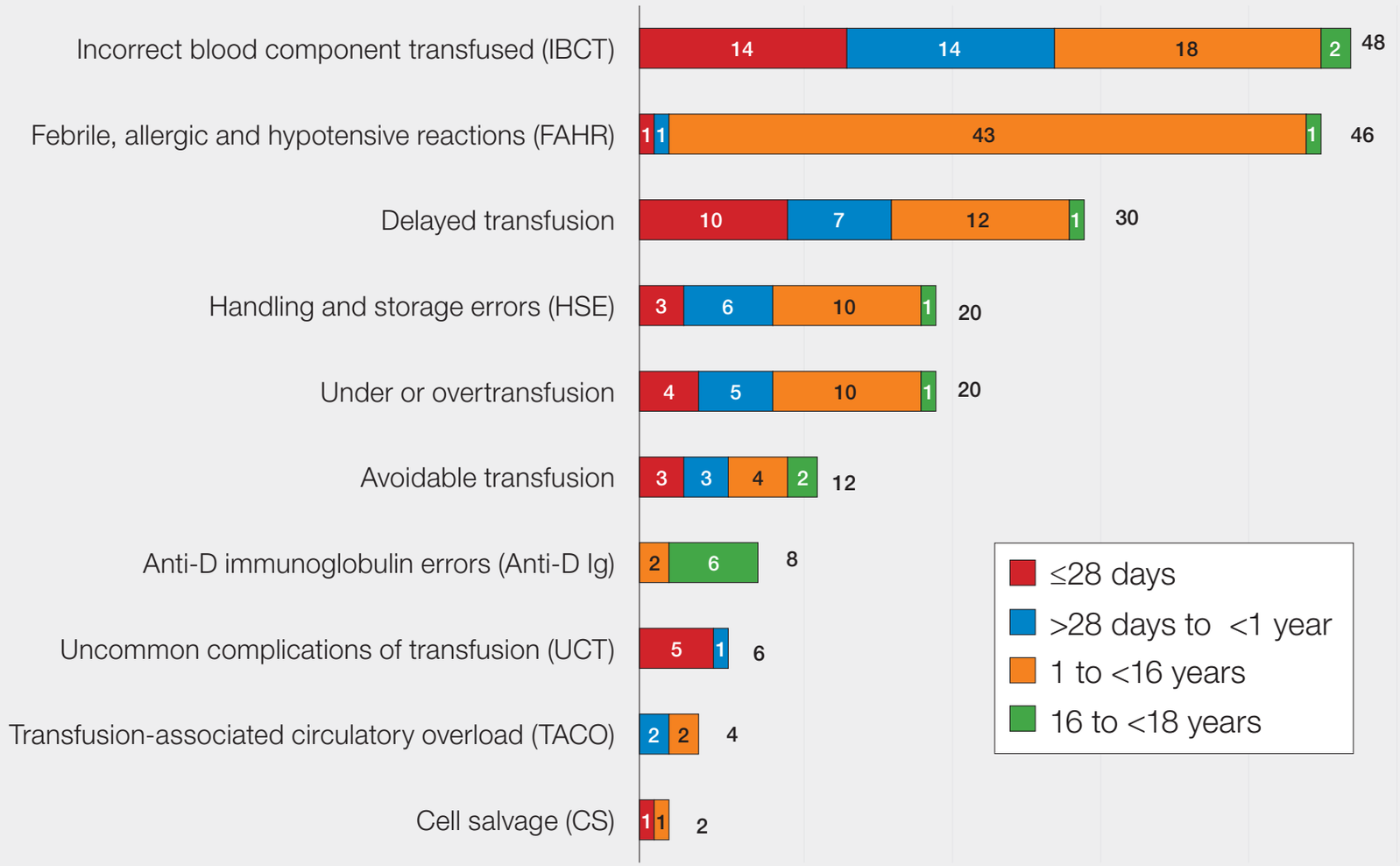
Figure 23.1: Outcomes of suspected TTI investigated in 2024 and reported to NHSBT/UKHSA Epidemiology Unit for England, Northern Ireland, Scotland, and Wales



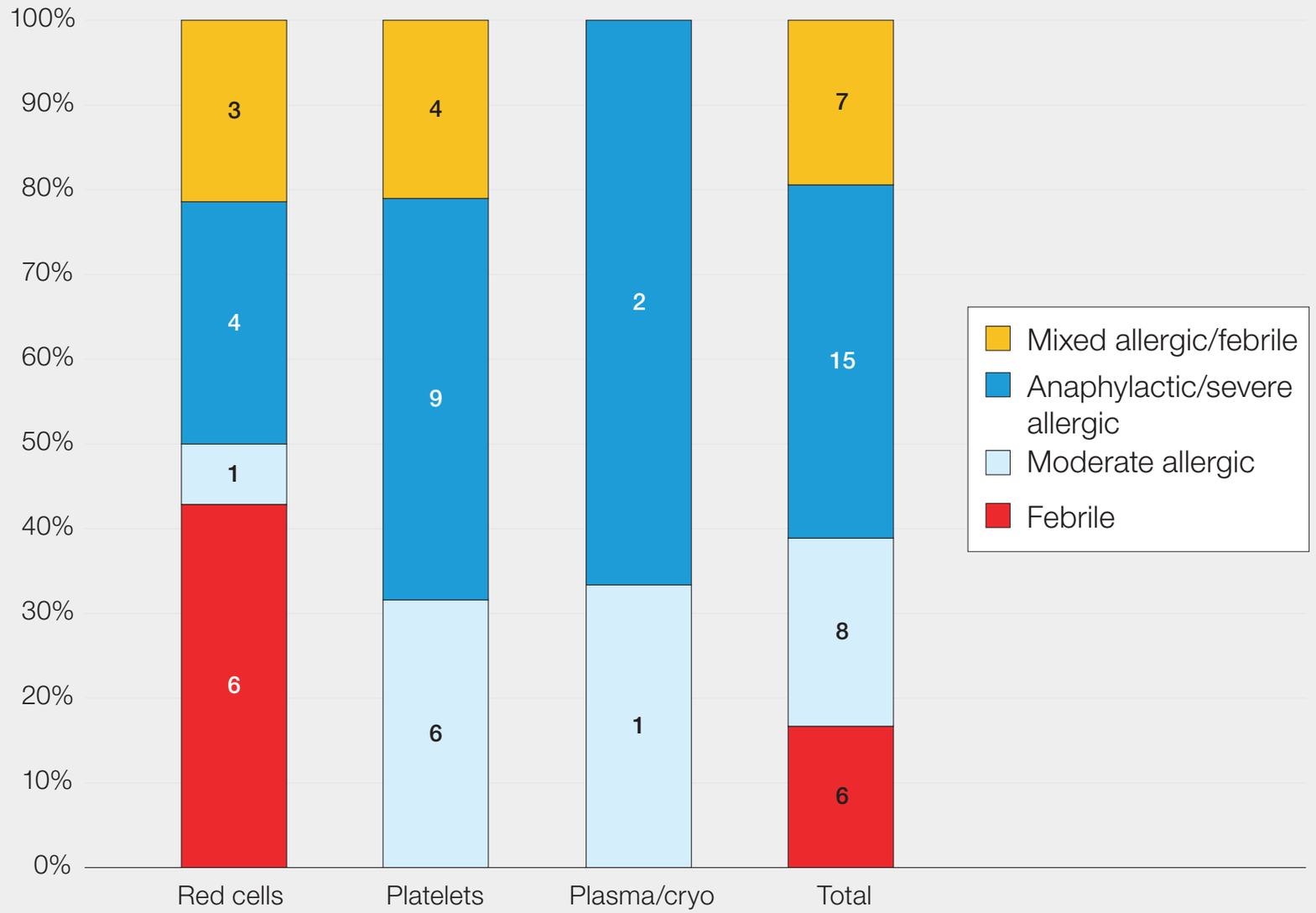
## Figure 25.1: Trends in paediatric reports 2015-2024



## Figure 25.2: Summary of paediatric cases by category and age in 2024 (n=202)

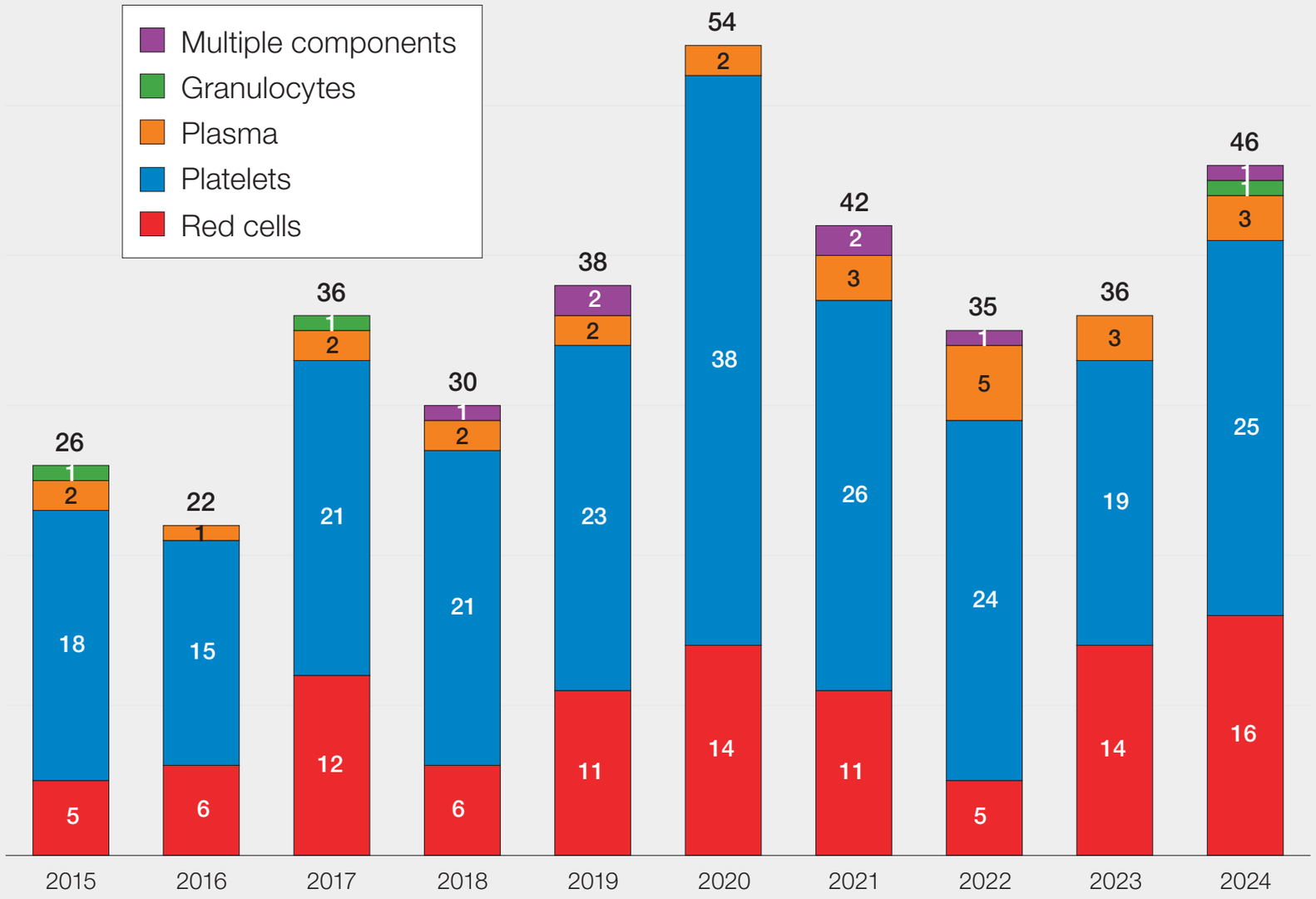


## Figure 25.3: Percentages of paediatric and total reports in each category in 2024 (n=202)

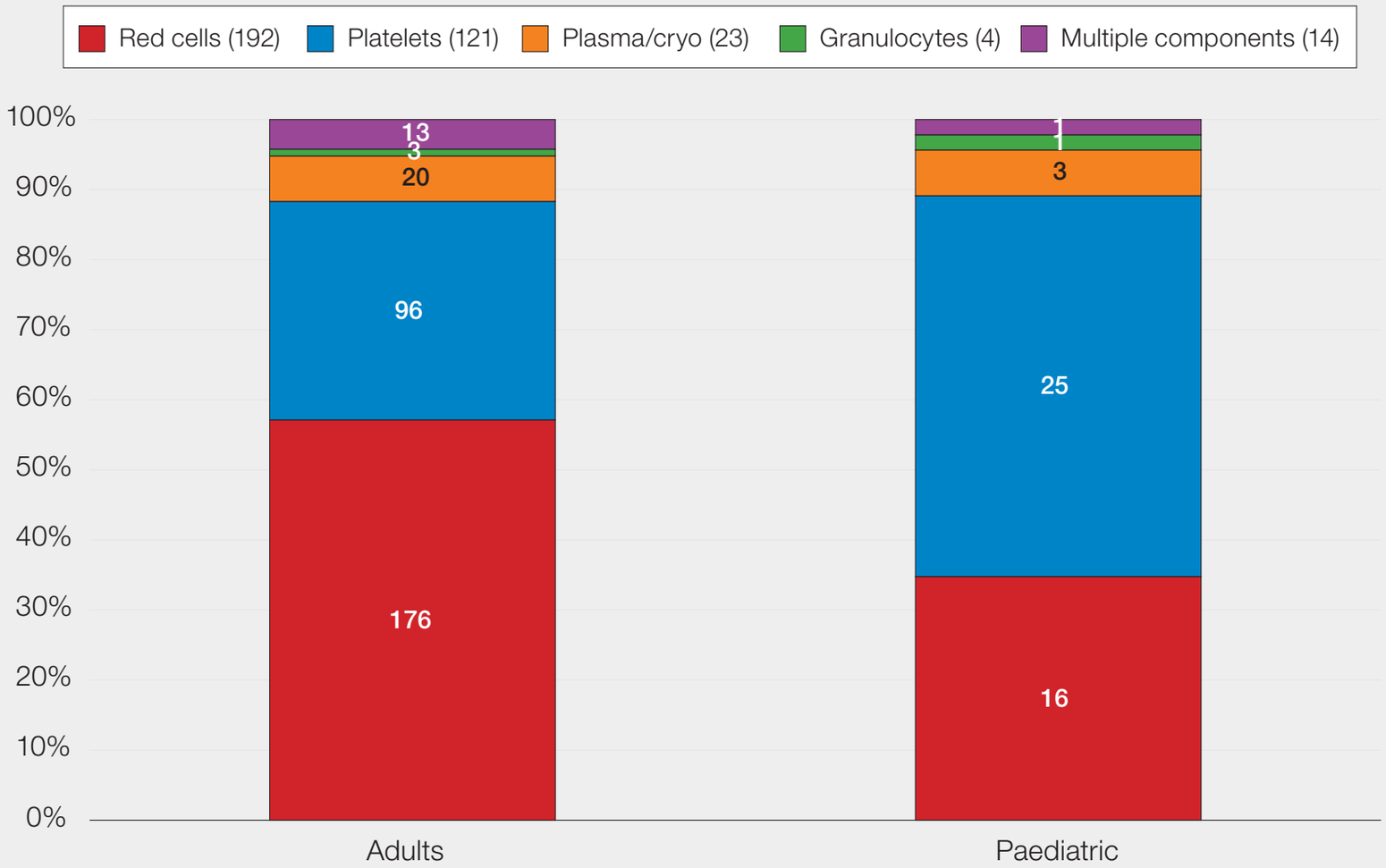



*CS=cell salvage; FAHR=febrile allergic and hypotensive reactions; HSE=handling and storage errors; HTR=haemolytic transfusion reactions; IBCT-SRNM=incorrect blood component transfused-specific requirements not met; IBCT-WCT=IBCT-wrong component transfusion; Ig=immunoglobulin; TACO=transfusion-associated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

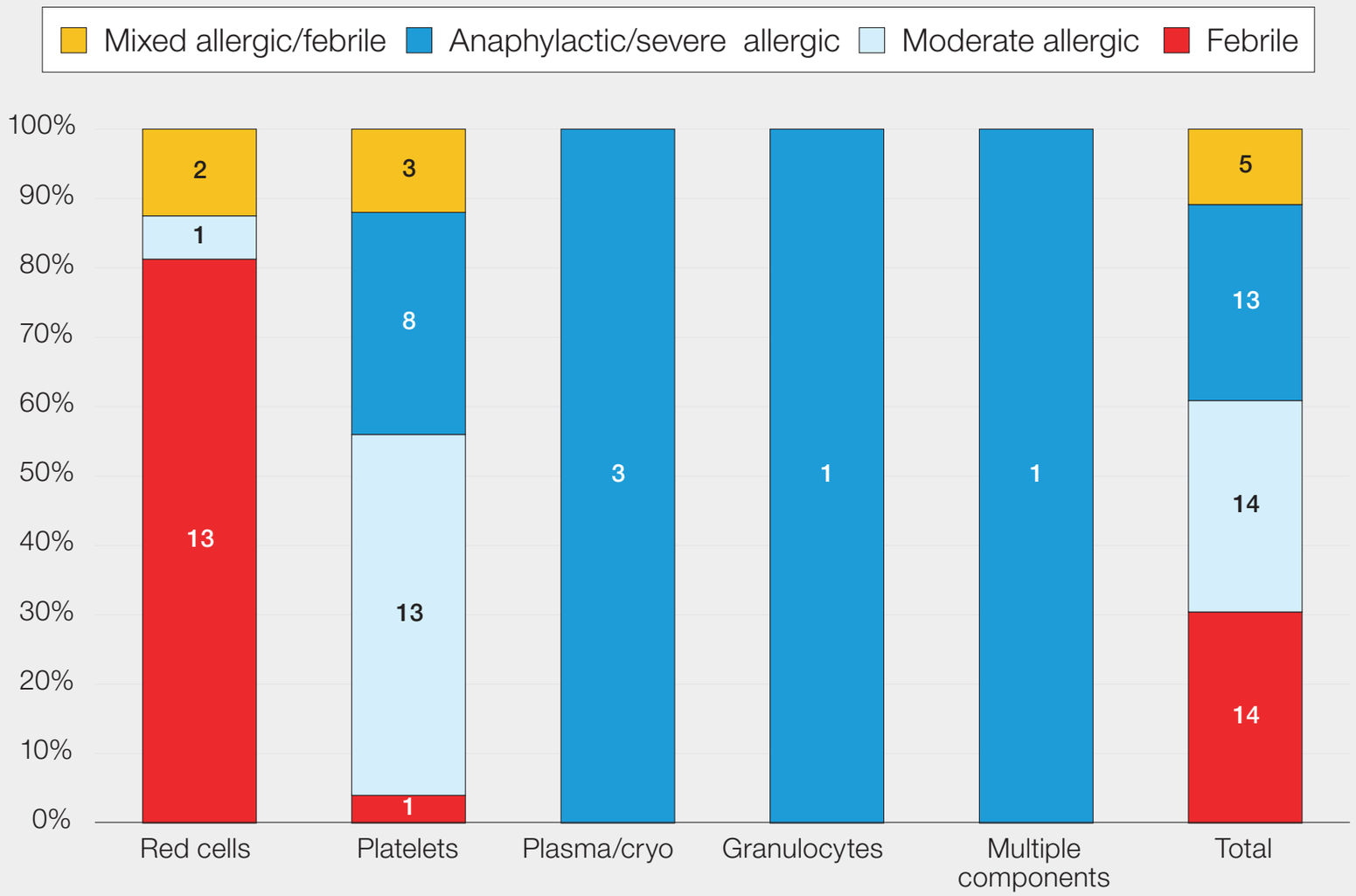
## Figure 25.4: Summary of paediatric FAHR reports by component from 2015-2024



## Figure 25.5: Paediatric FAHR reports in 2024 (n=46)
## a: Comparison of proportions of adult and paediatric reports by component types

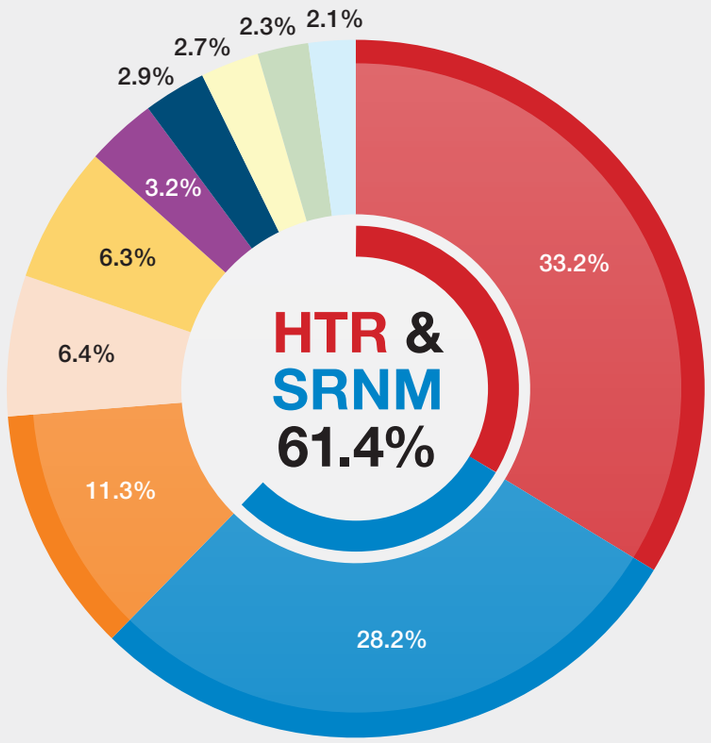


## Figure 25.5: Paediatric FAHR reports in 2024 (n=46)
## b: Percentages of reaction types in paediatric FAHR related to different component types



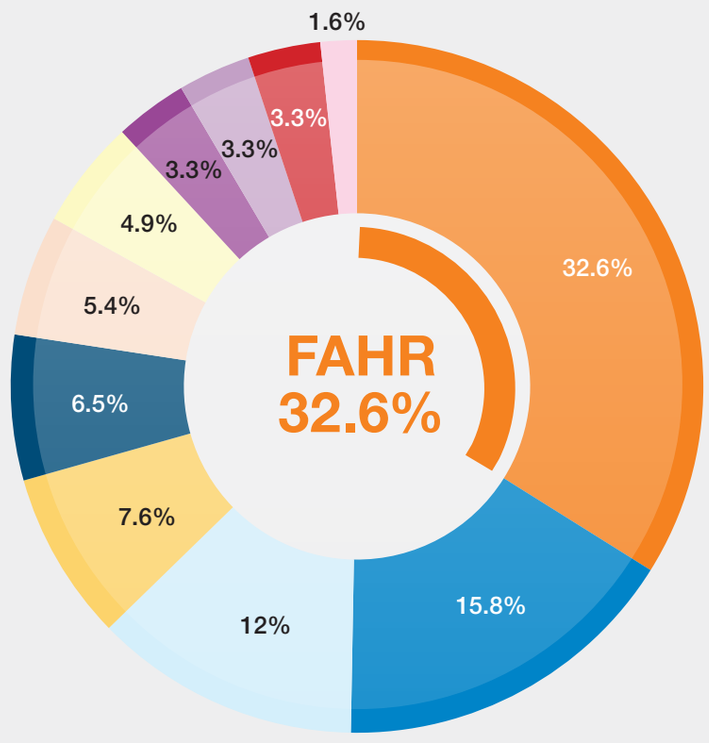
## Figure 26.1: Cumulative data for adverse transfusion events in patients with haemoglobin disorders 2010 to 2024

### a. Sickle cell disease (n=560)




| | | | | | |
|---|---|---|---|---|---|
| (186) | HTR | (16) | RBRP | | |
| (158) | IBCT-SRNM | (15) | Under or overtransfusion | | |
| (63) | FAHR | (13) | Avoidable transfusion | | |
| (36) | Delayed transfusion | (12) | HSE | | |
| (35) | NM | | | | |
| (18) | IBCT-WCT | | | | |

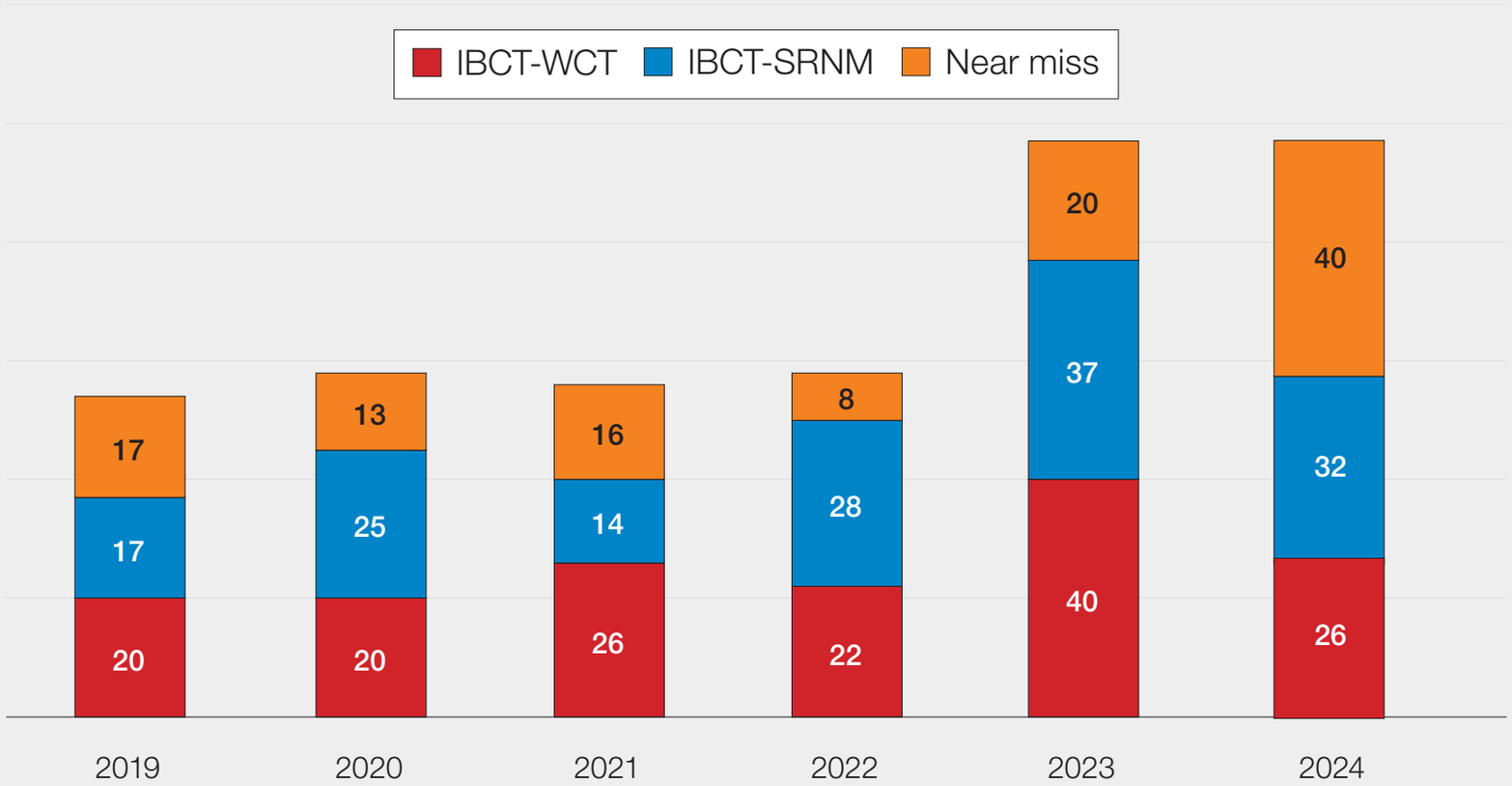
### b. Thalassaemia (n=184)




| | | | | | |
|---|---|---|---|---|---|
| (60) | FAHR | (12) | RBRP | (6) | UCT |
| (29) | IBCT-SRNM | (10) | Delayed transfusion | (6) | HTR |
| (22) | HSE | (9) | Under or overtransfusion | | |
| (14) | NM | (6) | IBCT-WCT | (3) | ALLO |

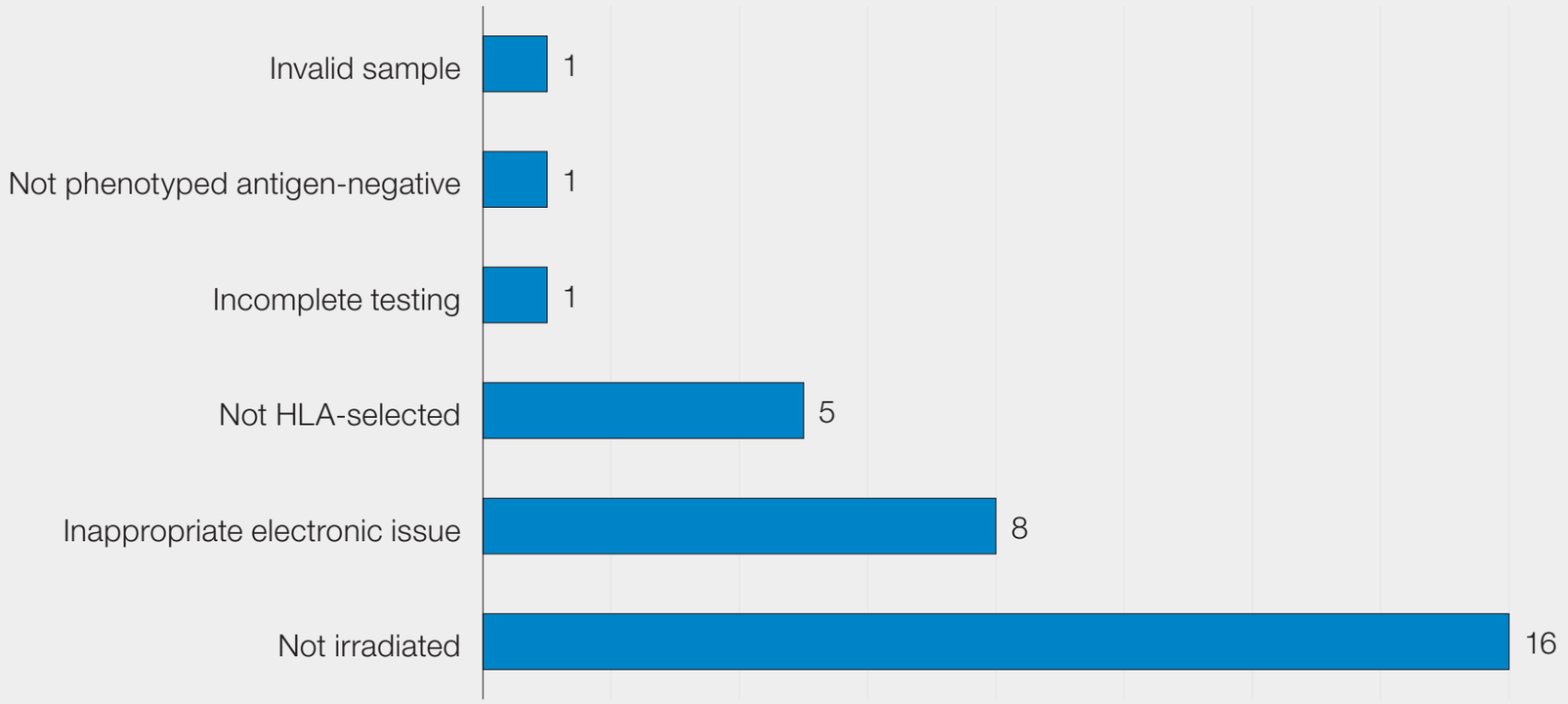
*ALLO=alloimmunisation; FAHR=febrile, allergic or hypotensive reactions; HSE=handling and storage errors; HTR=haemolytic transfusion reactions; IBCT=incorrect blood component transfused; NM=near miss; RBRP=right blood right patient; SRNM=specific requirements not met; TACO=transfusion-associated circulatory overload; TTI=transfusion-transmitted infection; UCT=uncommon complications of transfusion; WCT=wrong component transfused. Categories with 2 or fewer reports are not included in the figures*

## Figure 27.1: Number of transplant-related reports (HSCT and SOT) from 2019 to 2024



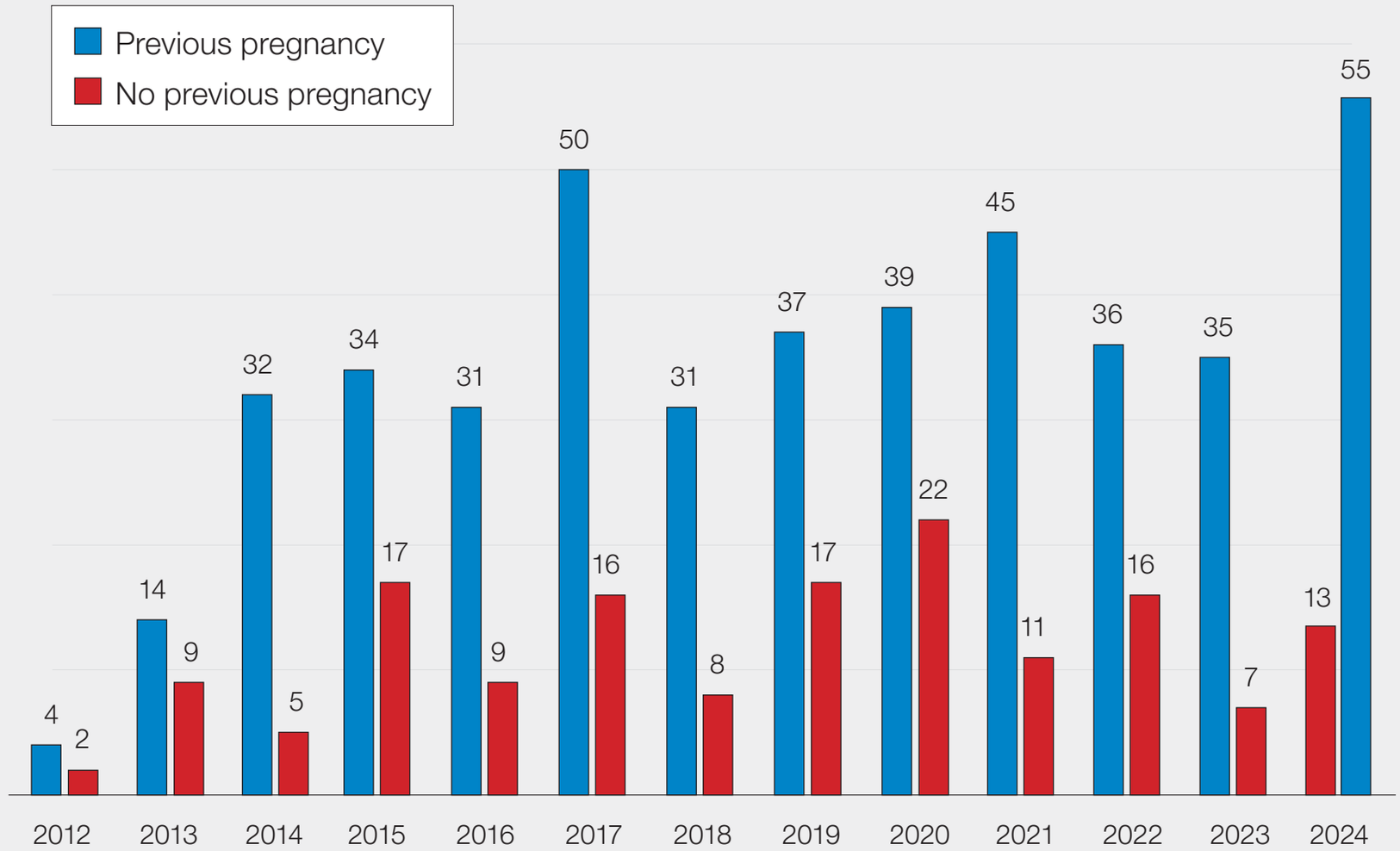

*IBCT-SRNM=incorrect blood component transfused-specific requirements not met; IBCT-WCT=IBCT-wrong component transfused*

## Figure 27.2: Errors related to specific requirements not met in transplant recipients in 2024 (n=32)

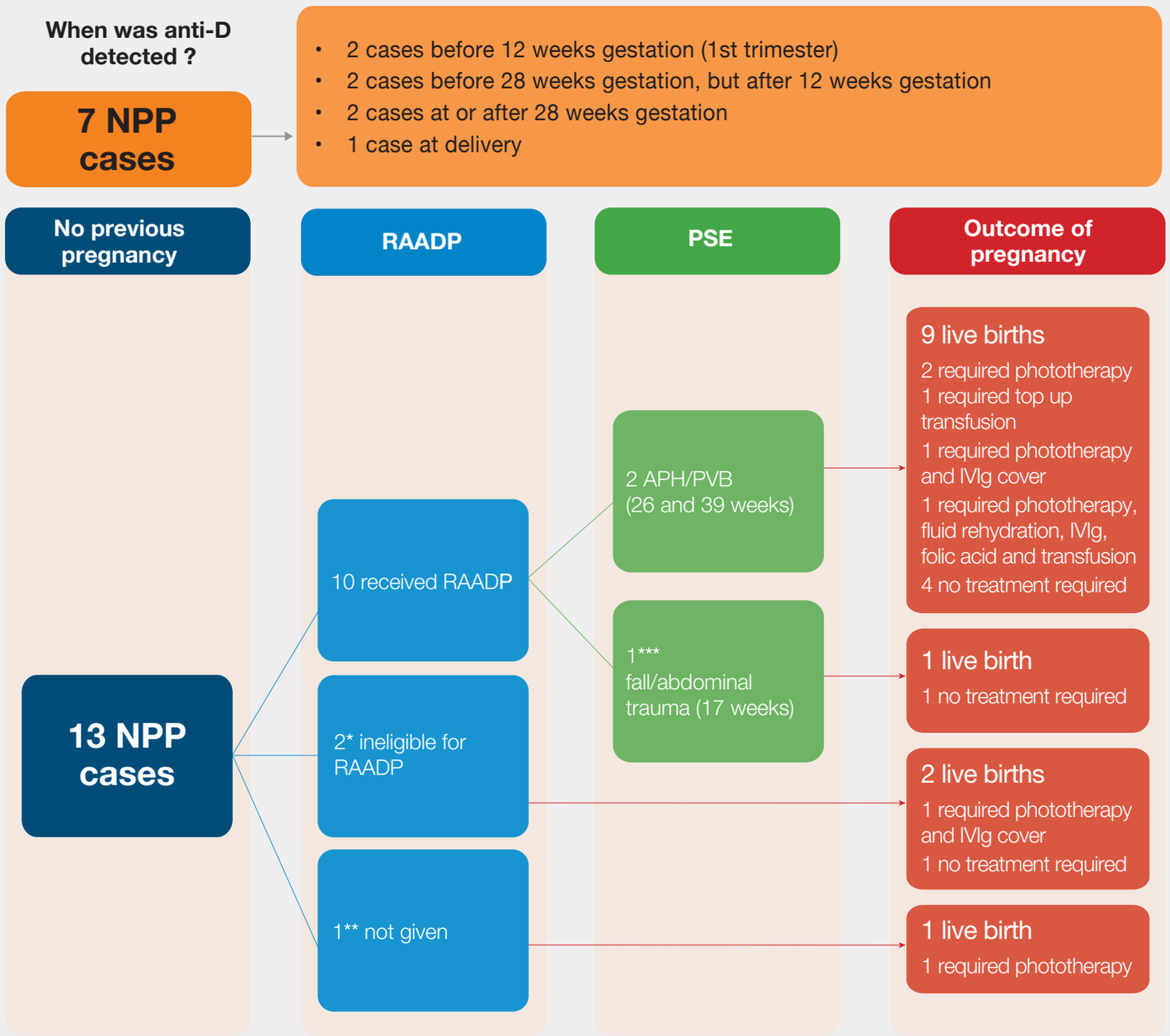



*HLA=human leucocyte antigen*

## Figure 28.1: Number of SHOT reports of D immunisation by year, 2012-2024



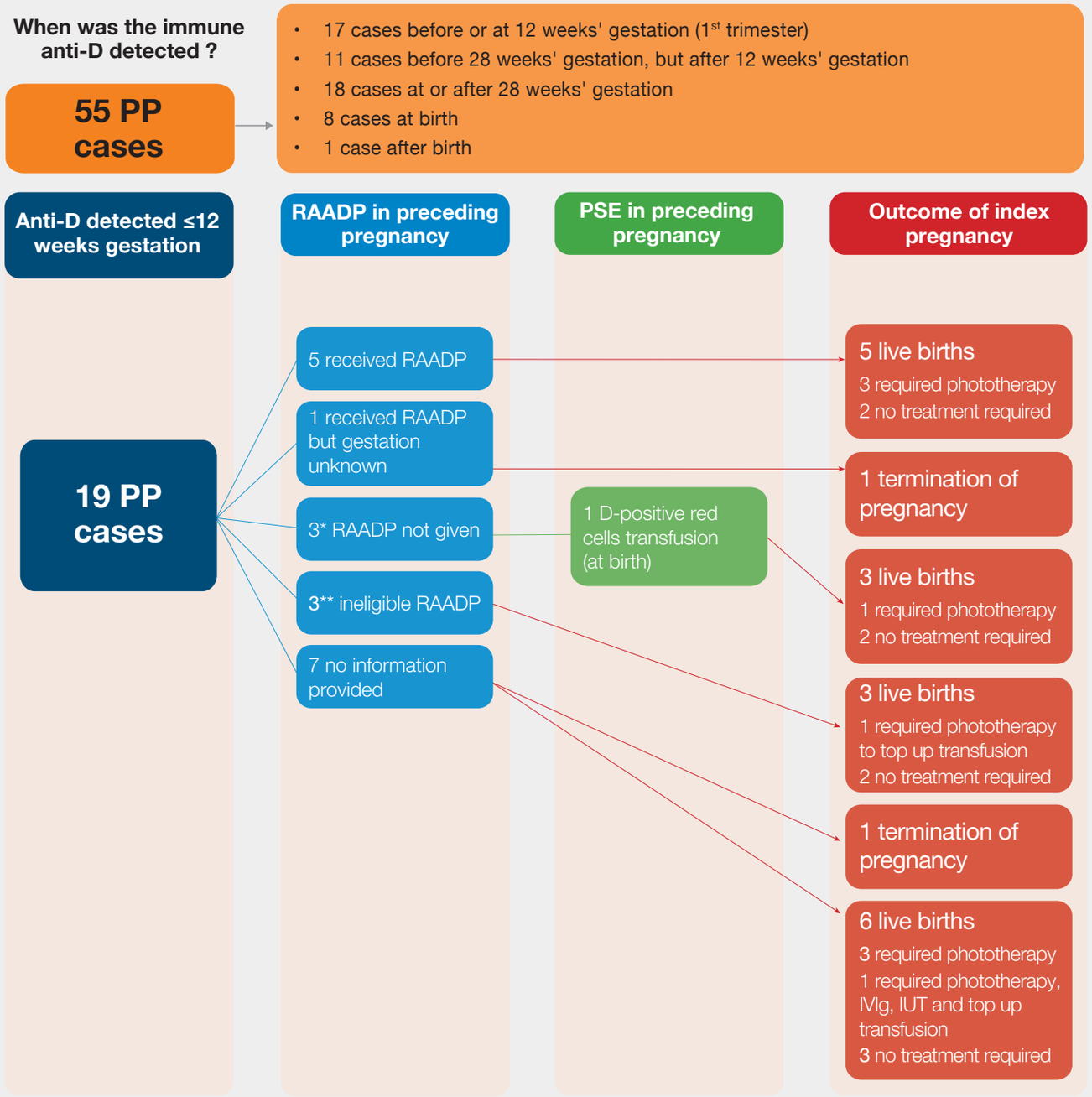
## Figure 28.2: Summary of the 2024 NPP data (n=13)




*APH=antepartum haemorrhage; IVIg=intravenous immunoglobulin; NPP=no previous pregnancy; PSE=potentially sensitising event; PVB=per vaginal bleeding; RAADP=routine antenatal anti-D Ig prophylaxis*

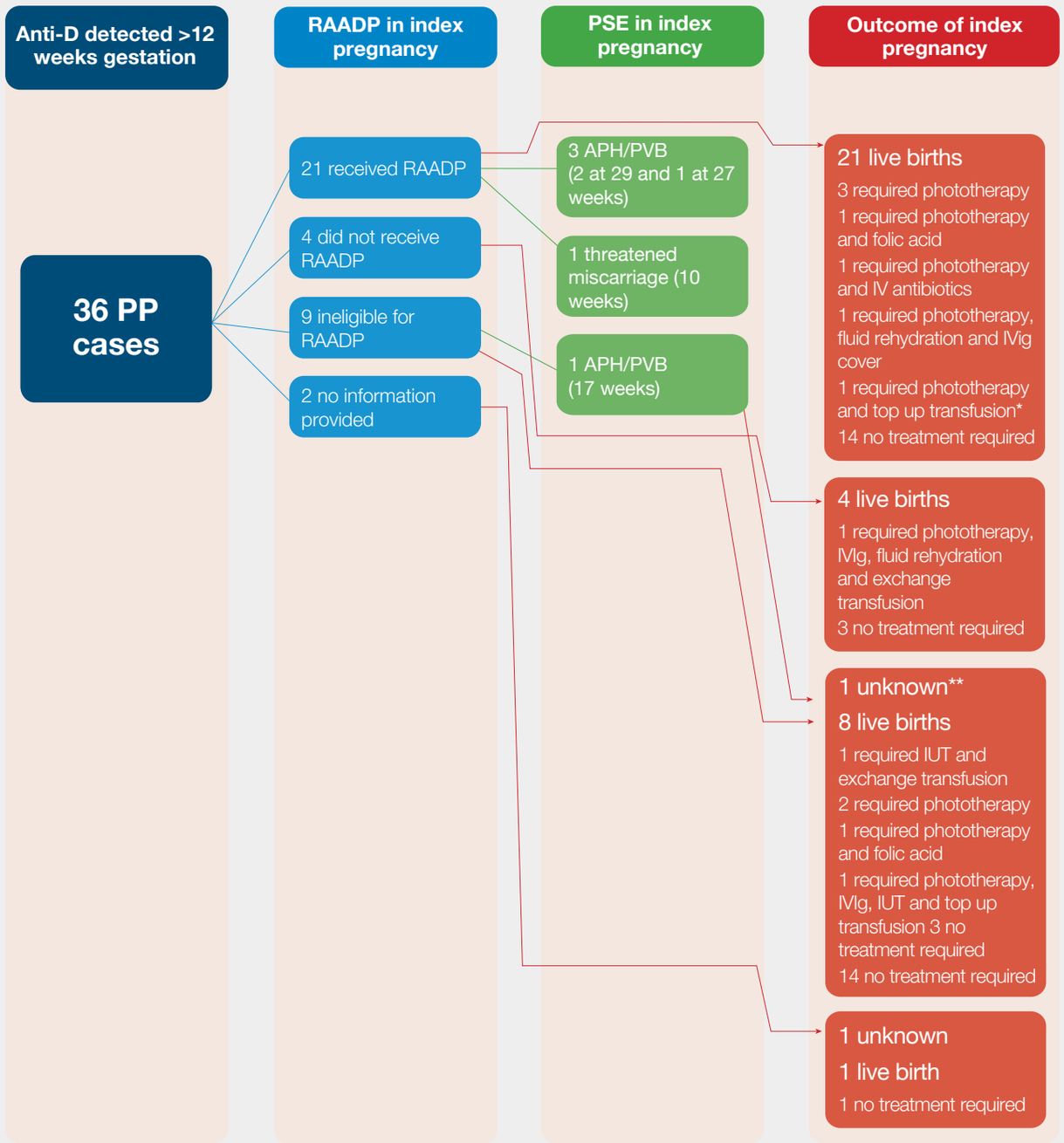
**Immune anti-D detected before 28 weeks gestation (at 12+4- and 27-weeks' gestation) **Woman concealed pregnancy until 37 weeks gestation ***PSE at 17+5 weeks, anti-D Ig given beyond 72 hours post PSE. Anti-D and anti-C detected at birth.*

## Figure 28.3a: Summary of the 2024 PP data (n=55) where anti-D was detected ≤12 weeks gestation (n=19)



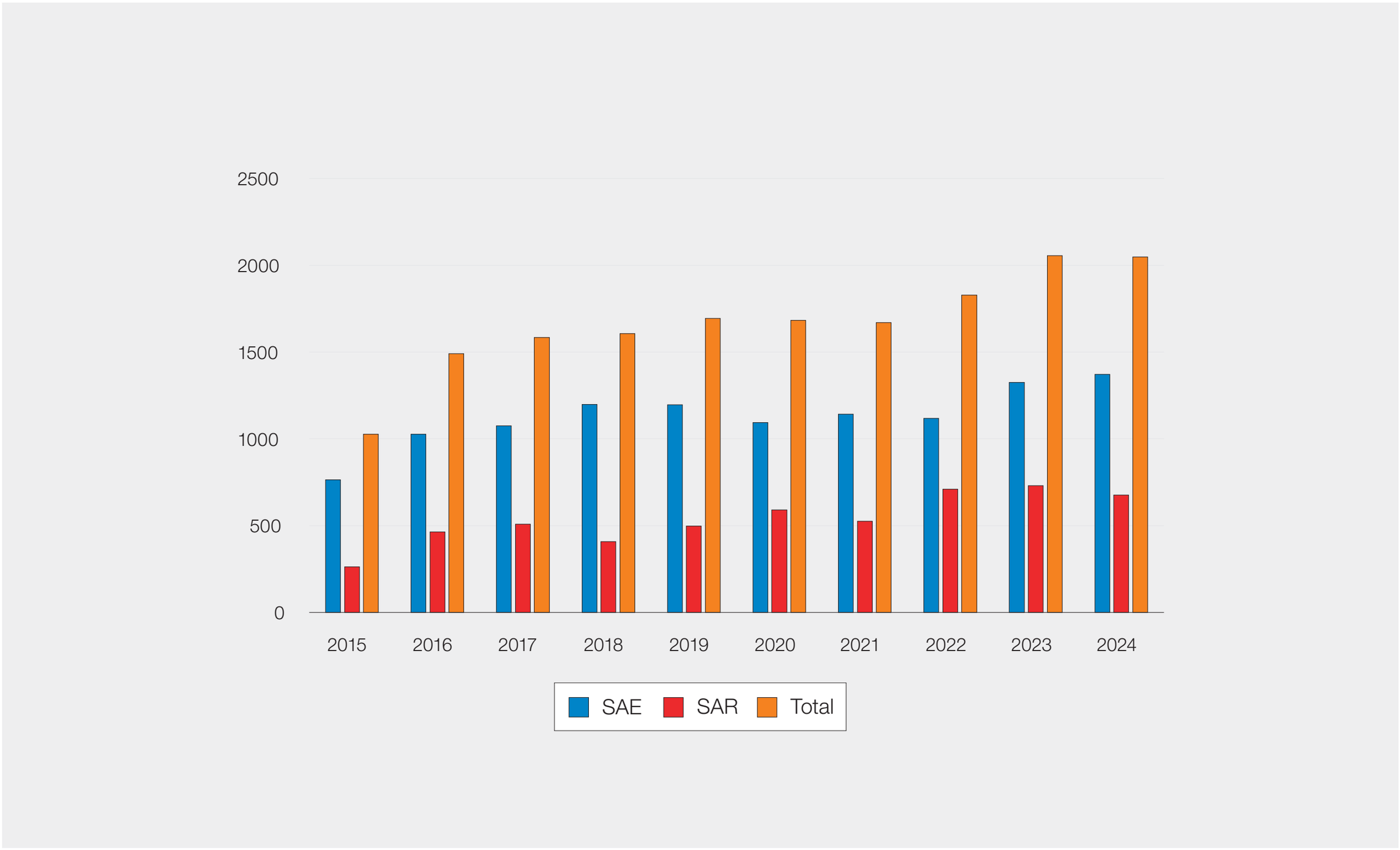

*IUT=intrauterine transfusion; IVIg=intravenous immunoglobulin; PP=previous pregnancy; PSE=potentially sensitising event; RAADP=routine antenatal anti-D Ig prophylaxis*
**1 case RAADP was not part of the policy, 1 case D-variant woman treated as D-positive  **2 cases of miscarriage <12 weeks gestation and 1 case immune anti-D already present*

## Figure 28.3b: Summary of the 2024 PP data where anti-D was detected >12 weeks gestation (n=36)



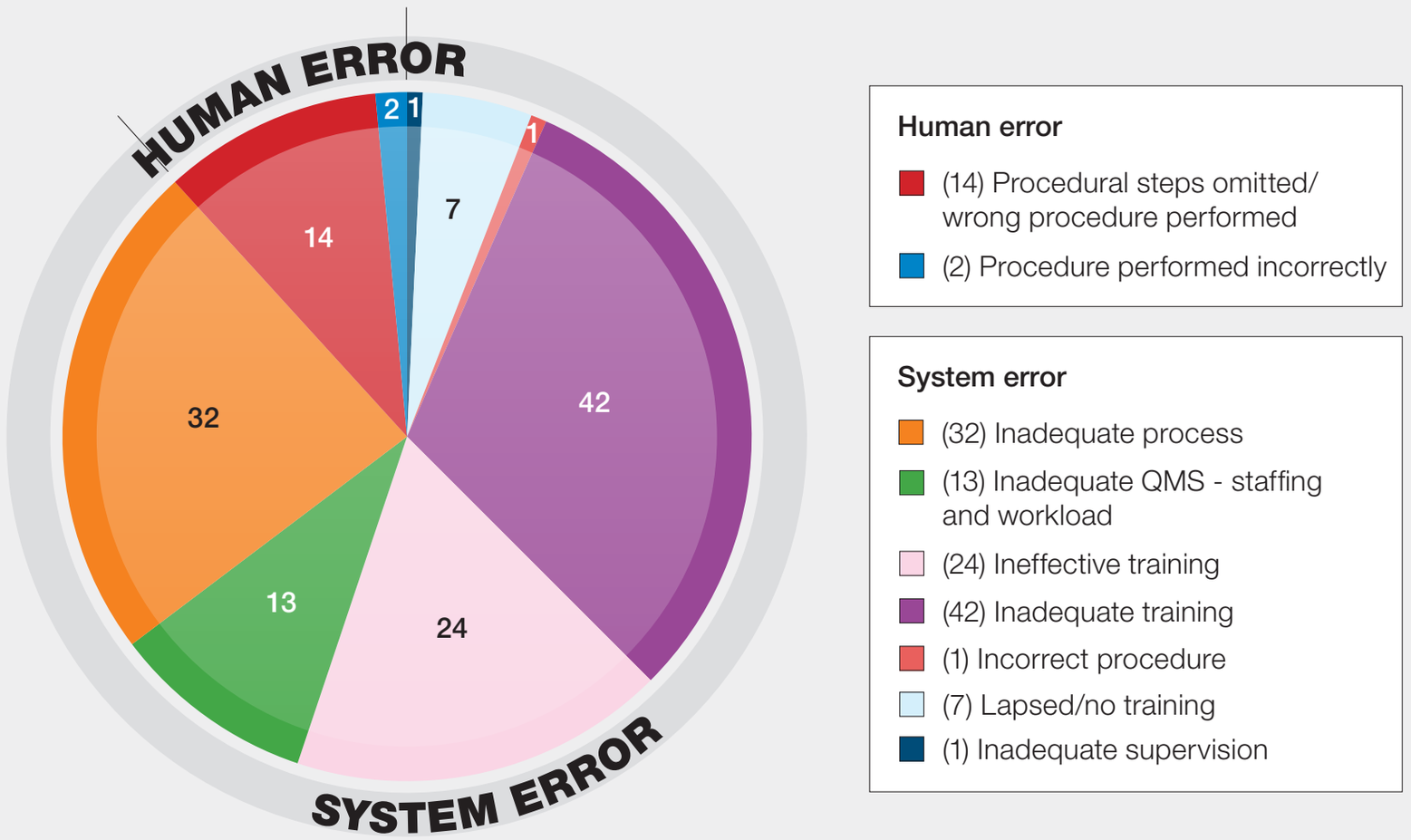

*APH=antepartum haemorrhage; IUT=intrauterine transfusion; IV=intravenous; IVIg=IV immunoglobulin; PP=previous pregnancy; PSE=potentially sensitising event; PVB=per vaginal bleeding; RAADP=routine antenatal anti-D Ig prophylaxis*
**Twin pregnancy, one of the twins required transfusion as well as phototherapy  ** 1 case pregnant woman moved abroad no information available including birth*

## Figure 29.1: Submitted confirmation reports 2015-2024



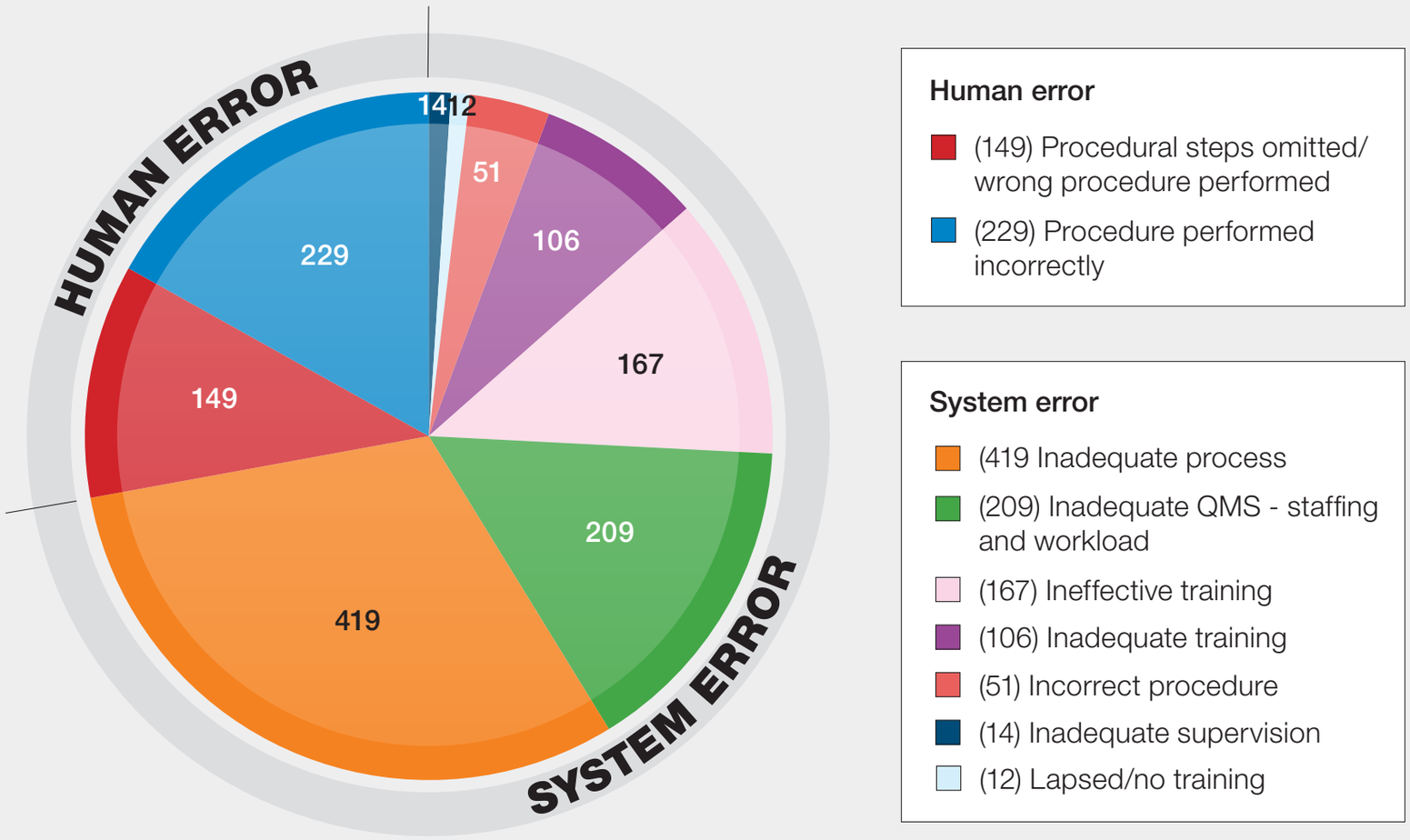

*SAE=serious adverse event; SAR=serious adverse reaction*

## Figure 29.2: Root causes of incorrect storage of components sub-category (n=136)



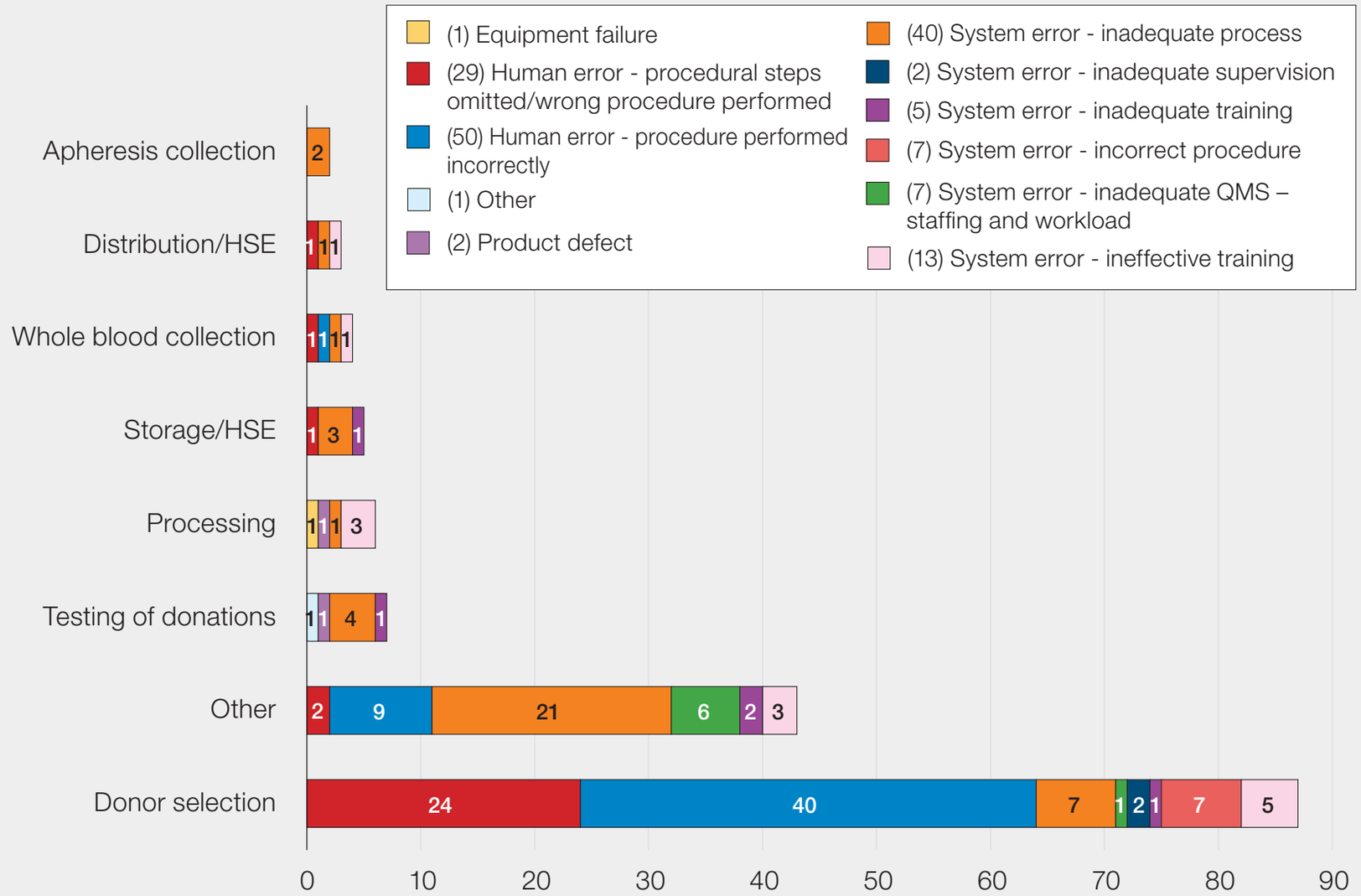

*QMS=quality management system*

## Figure 29.3: Human/system error sub-categories (n=1356)



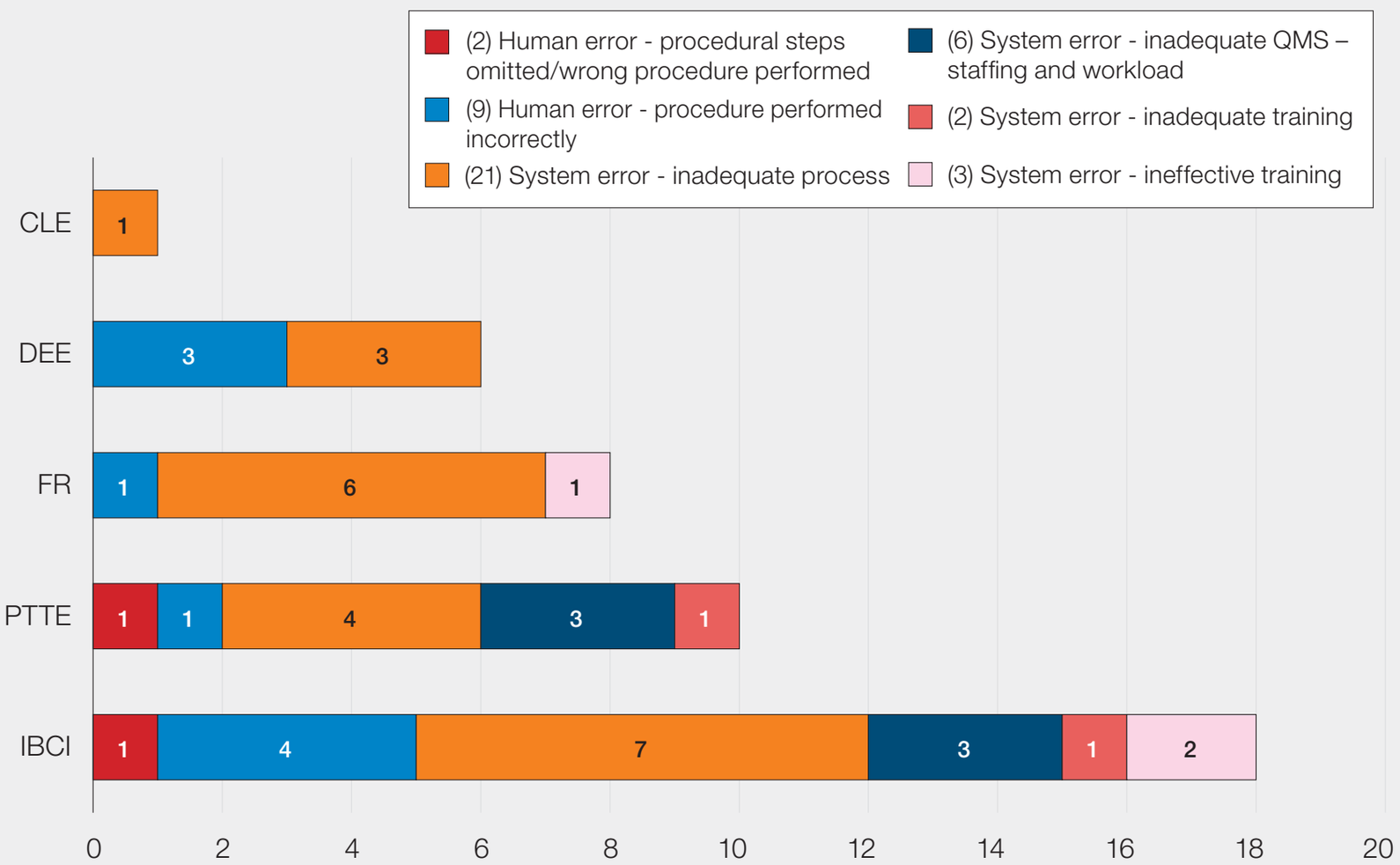

*QMS=quality management system*

## Figure 29.4: Blood establishment SAE event category by specification (n=157)



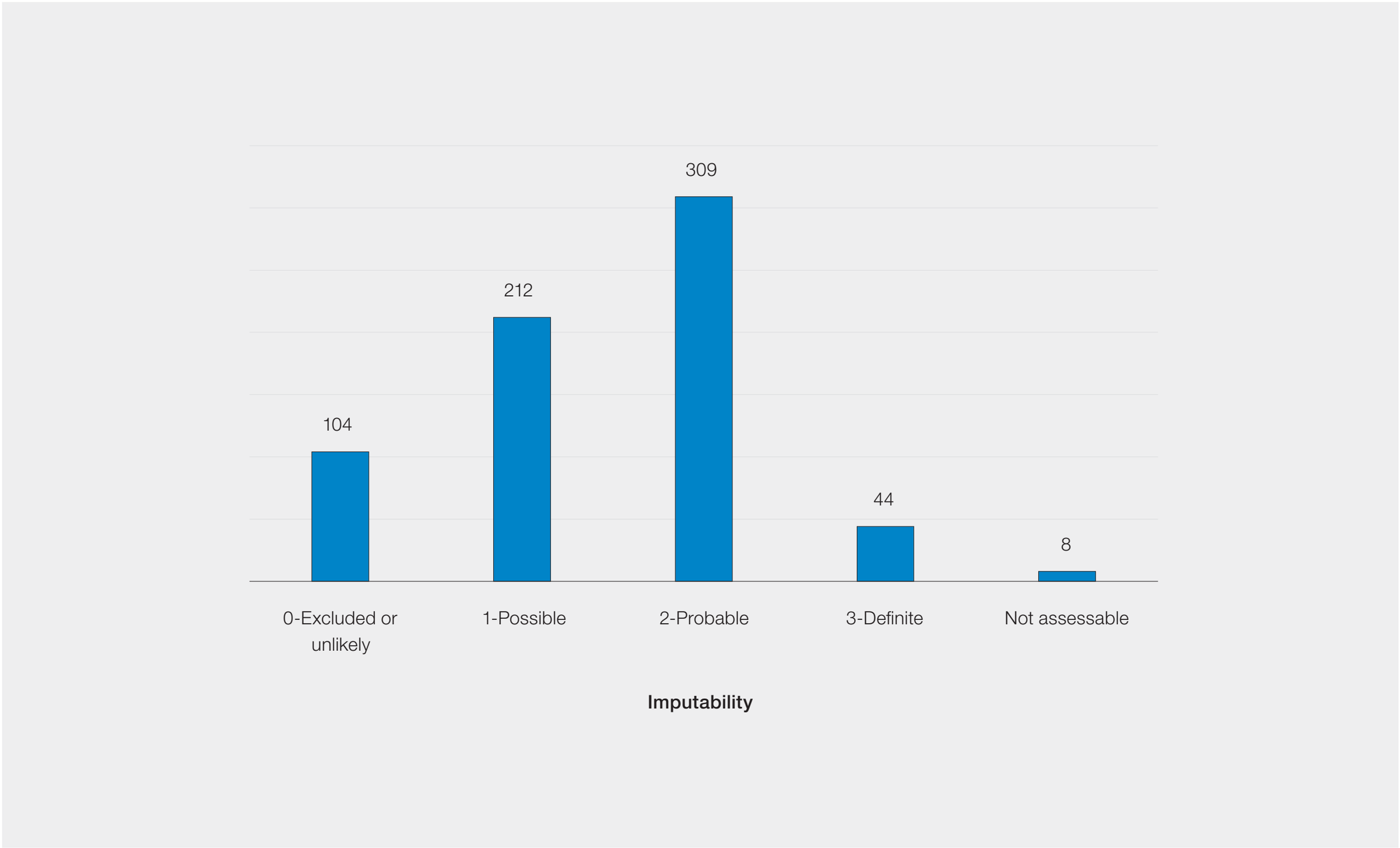

*QMS=quality management system*

## Figure 29.5: BE reports in ‘other’ category (n=43)

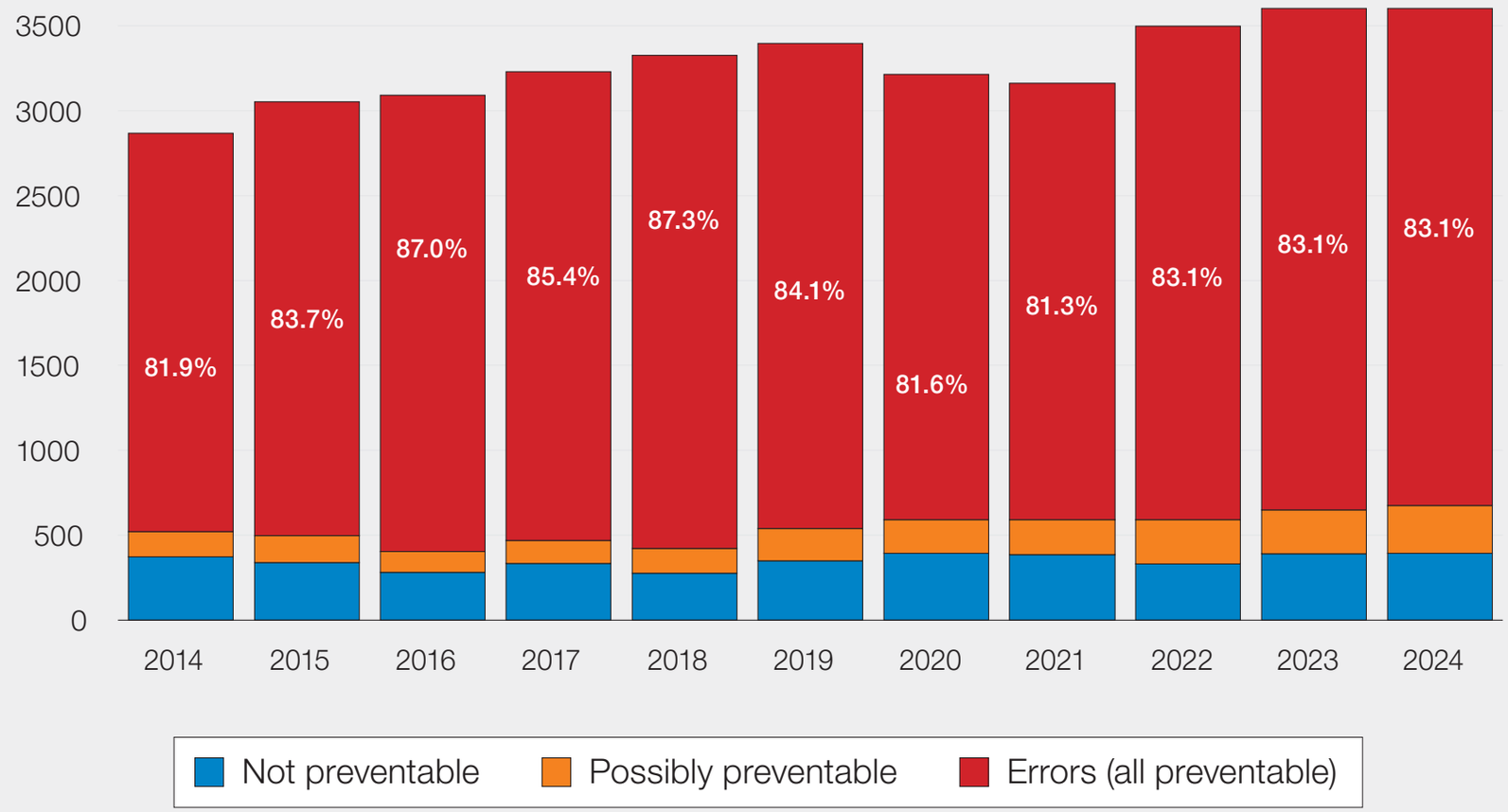



*See Appendix 2 for key to category abbreviations*
*QMS=quality management system*

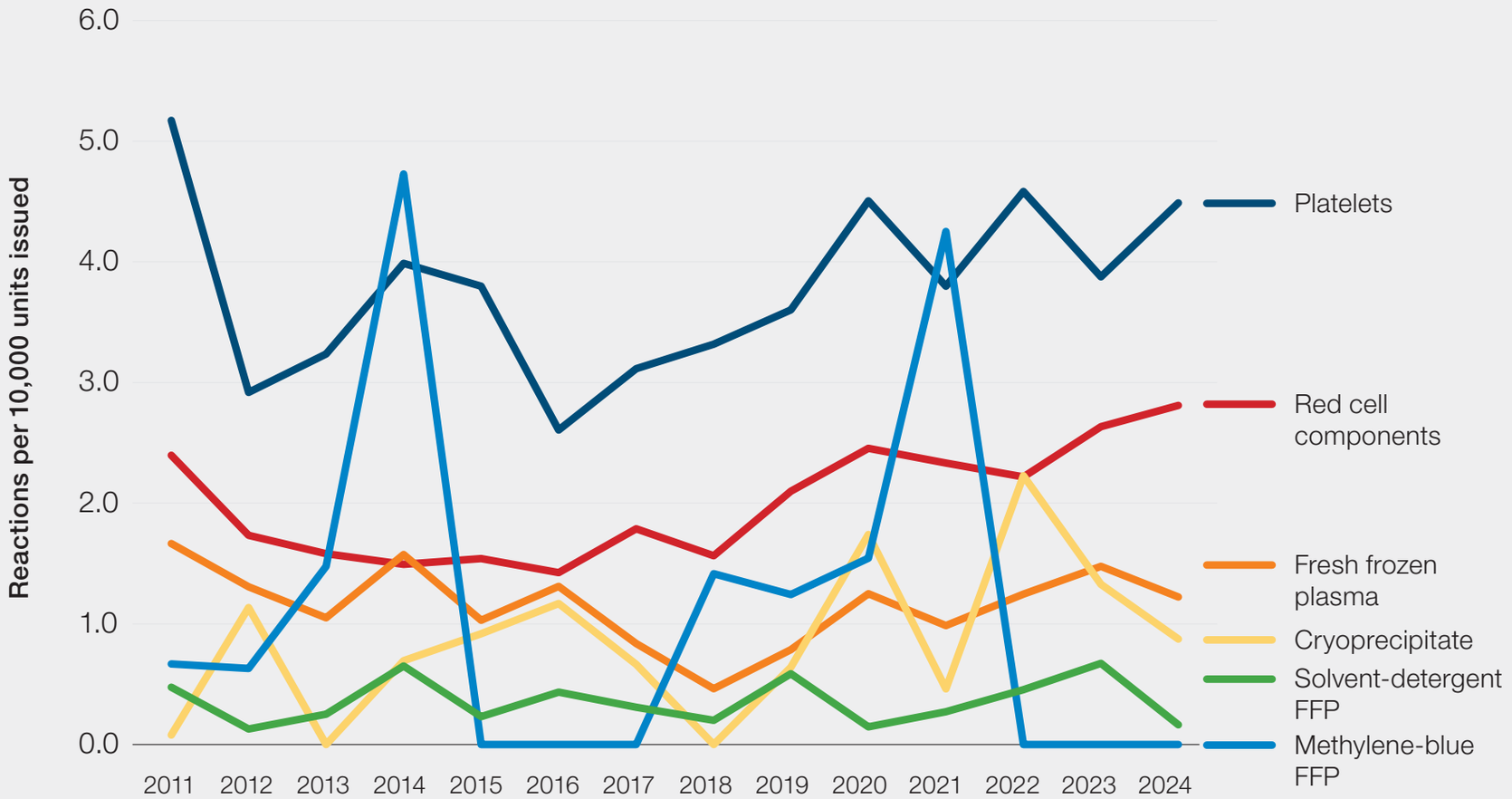
## Figure 29.6: SAR reports, by imputability, reported to SABRE in 2024 (n=677)



## Errors as a percentage of total reports 2014-2024



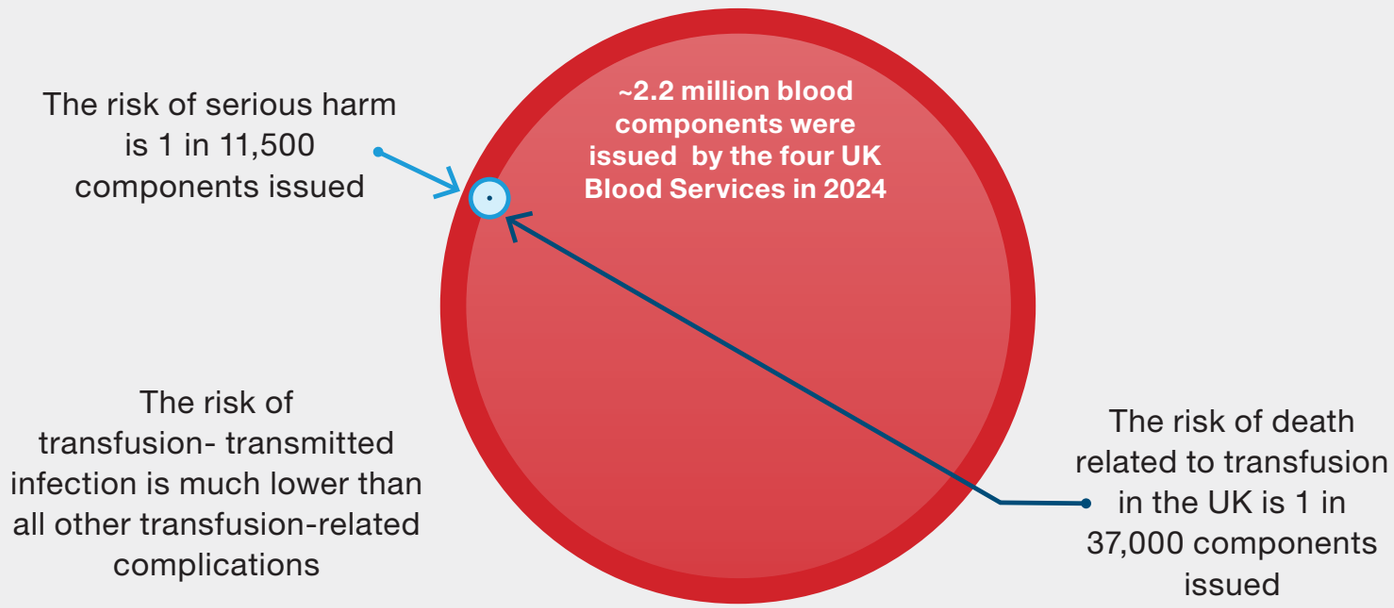
## Reactions per 10,000 components, by component type 2011-2024




***Note: Not including convalescent plasma***

# Risk of death and serious harm relating to transfusions in the UK in 2024

The risk estimation is based on all incidents reported to SHOT including the process-based error reports received. This covers deaths with possible, probable and definite imputability.




*Note: This is a representative image and not accurate to scale*
*The estimated risks include risks of harm from errors in the transfusion pathway.*