Headline Data: Deaths, Major Morbidity and ABO-Incompatible Transfusions

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Key SHOT messages

- Errors continue to account for the majority of reports. In 2024, 3322/3998 (83.1%) of all reports (including near miss (NM) and right blood right patient (RBRP)), and 70.8% of incidents excluding NM and RBRP were due to errors
- There were no confirmed or probable transfusion-transmitted infections reported in 2024
- The risk of death related to transfusion in the United Kingdom (UK) is 1 in approximately 37,000 components issued, and the risk of serious harm is approximately 1 in 11,500 components issued (includes solvent detergent-treated fresh frozen plasma (SD-FFP) data) based on the reports submitted to SHOT
- Transfusion-related deaths reported to SHOT have almost doubled in 2024
- There were no deaths which were definitely related (imputability 3) to transfusion in 2024
- Pulmonary complications and transfusion delays were the main causes of reported transfusion-related deaths in 2024
- There has been a steep rise in deaths due to transfusion-associated circulatory overload (TACO)
- Near miss events continue to account for a large proportion, 1408/3998 (35.2%) of the incidents reported to SHOT
- Inadequate staffing, lack of appropriate training, suboptimal supervision and poor safety culture continue to be identified as contributory factors to numerous incidents reported to SHOT
- Trends in pathological transfusion reactions, like the febrile, allergic, hypotensive, and haemolytic reactions are similar to previous years
- It is encouraging to see a reduction in the ABO-incompatible (ABOi) red cell transfusions reported. However, ABOi plasma component transfusions continue to be reported: these were mainly due to component selection errors in the laboratory

Introduction

The SHOT haemovigilance data from 2024 indicate worsening trends, both in the numbers reported and the severity of cases. These are elaborated on further in this chapter and throughout the 2024 Annual SHOT Report.

The risk of death related to transfusion in the UK is 1 in approximately 37,000 components issued, and the risk of serious harm is approximately 1 in 11,500 components issued based on the reports submitted to SHOT. This includes the risks of harm from errors in the transfusion process. The risk of death has worsened in 2024 due to an increase in the number of transfusion-related deaths reported, mainly in TACO cases but also an increase in delayed transfusions.

Avoidable errors consistently account for most of the reports 3322/3998 (83.1%) (Figure 3.1), and this percentage has been unchanged for the last 3 years. This figure includes errors with no harm to patients but had the potential to do so, such as near misses and right blood right patient errors.

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

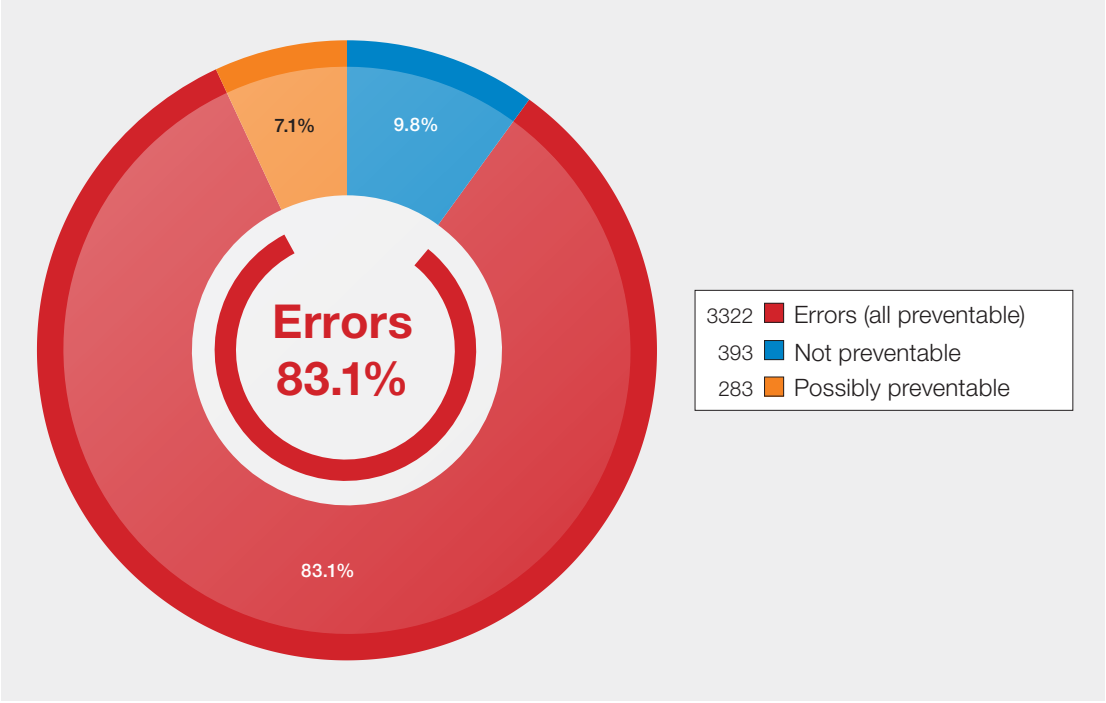
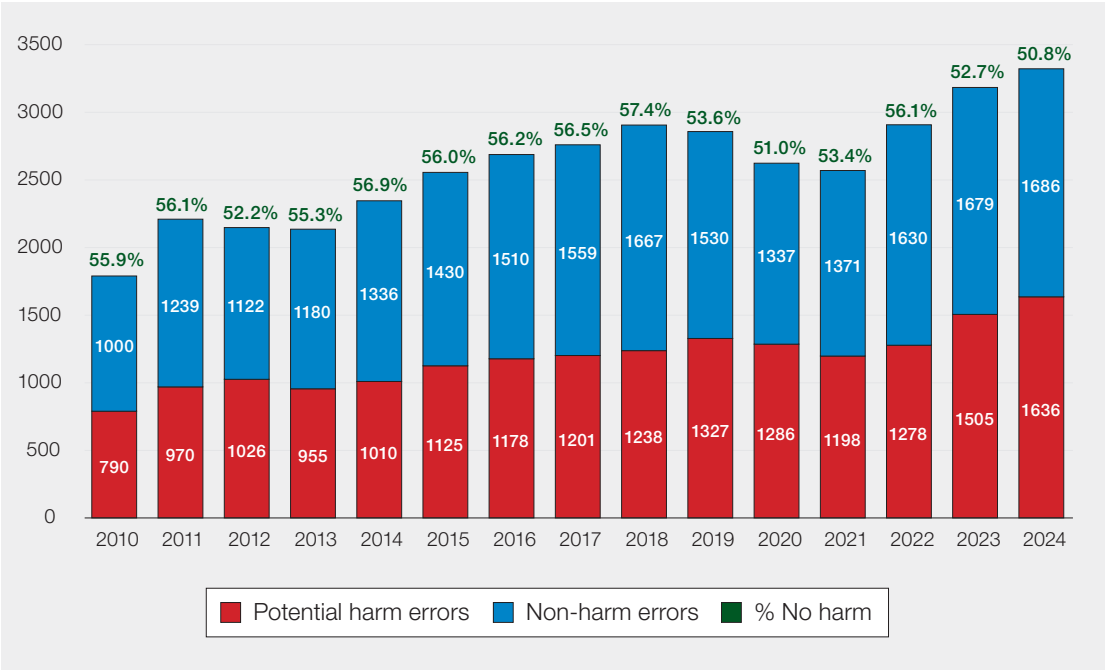


Figure 3.2 shows the percentage of no harm incidents in the errors reported to SHOT since 2010. The dip in the percentage of no-harm incidents noted in 2023 has increased further in 2024, and is now almost at 50%, which is less than 2020 when it was at its lowest since 2010. This highlights the urgent need for actions to improve transfusion safety.

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

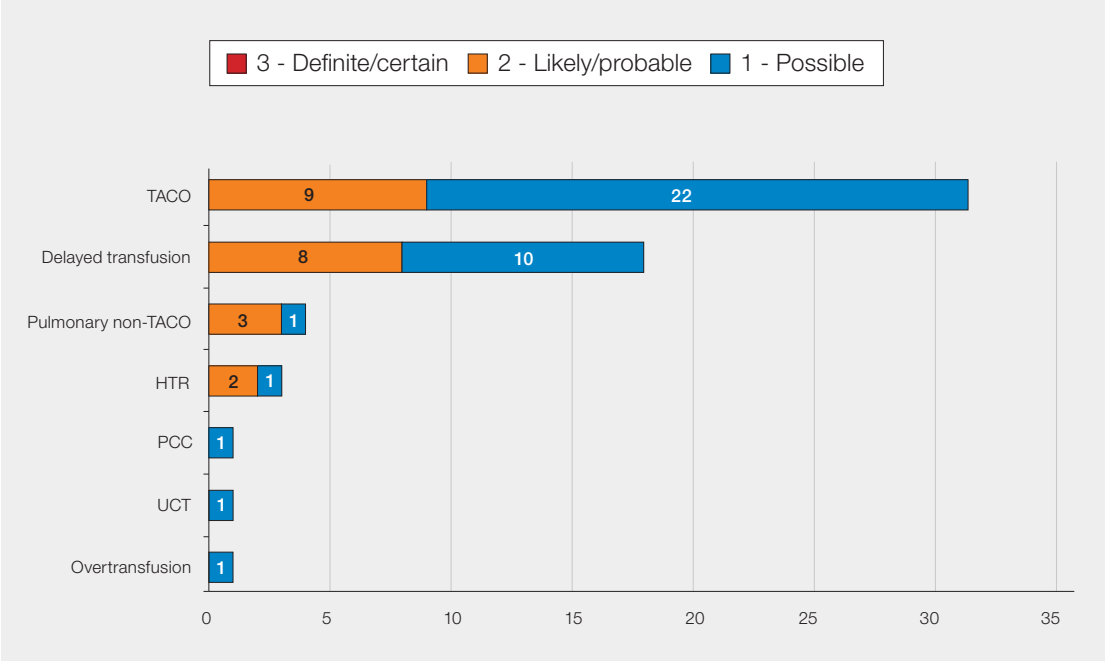
Deaths related to transfusion n=59

All serious reactions reported to SHOT are assessed for imputability i.e., the relationship of the blood transfusion to the reaction. The imputability criteria can be found in the SHOT definitions document (https://www.shotuk.org/reporting/incident/definitions/).

The number of reported deaths assessed as being related to the transfusion increased dramatically to 59 in 2024, from 38 in 2023. Pulmonary complications and transfusion delays were still the most common causes of transfusion-related deaths reported to SHOT in 2024, accounting for 53/59 (89.8%) of total deaths. In 2024, TACO (n=31) was responsible for the highest number of deaths in a single category reported to SHOT, followed by delays (n=18). The number of deaths in both these categories has doubled since 2023. The slight decrease in the number of deaths due to transfusion delays seen in 2023 was hoped to have been a result of the impact of the Medicines and Healthcare products Regulatory Agency (MHRA)/SHOT central alerting system (CAS) alert (SHOT, 2022), however this has not been sustained in the 2024 data.

Key factors identified in transfusion-related deaths are discussed in the relevant chapters of this Annual SHOT Report. Figure 3.3 shows the distribution of deaths related to transfusion reported in 2024 and respective imputability. There were no deaths in 2024 that were considered to be directly and solely the result of the transfusion.

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 shows the deaths reported to SHOT 2010-2024 reflecting the degree of imputability assigned. While the number of deaths definitely related to the transfusion episode have remained low, the rising trend in the overall number of deaths is concerning. While longstanding issues remain unresolved, additional challenges have become evident with patients accessing healthcare having more complex needs and often affected by multiple co-morbidities. These are further compounded by financial constraints limiting expenditure on resources that are crucial for patient safety, such as staffing levels, staff training, IT equipment and investment in appropriate facilities. Without decisive actions to address these gaps, the situation is likely to worsen with missed opportunities to rectify preventable factors and optimise safety.

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

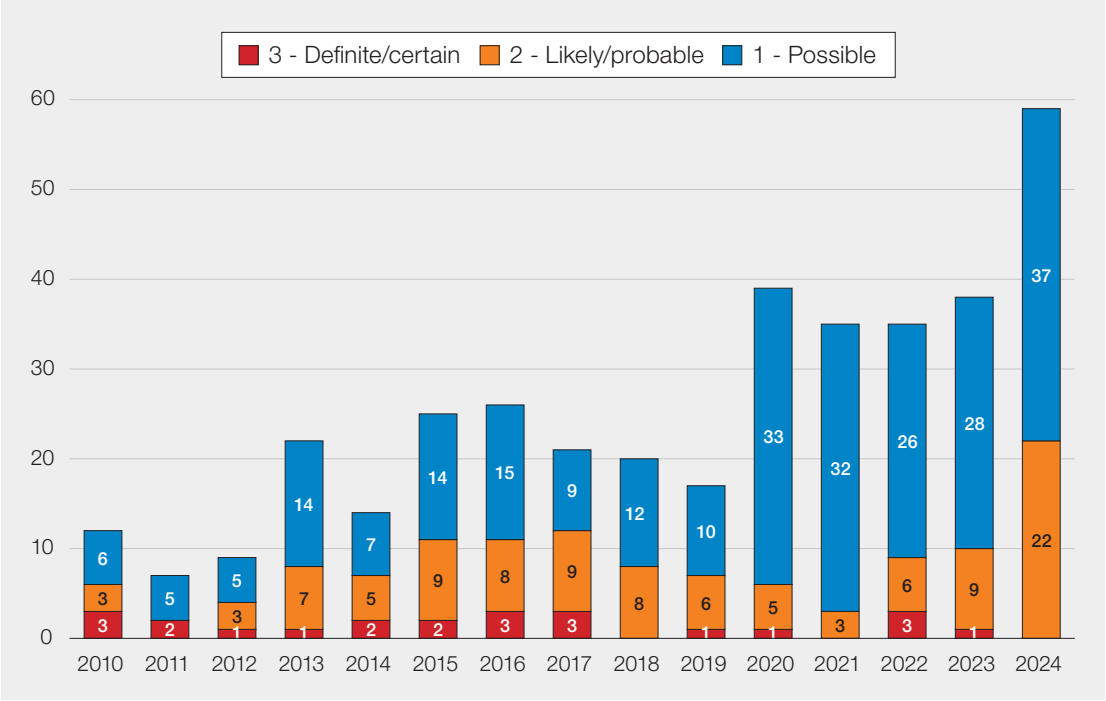
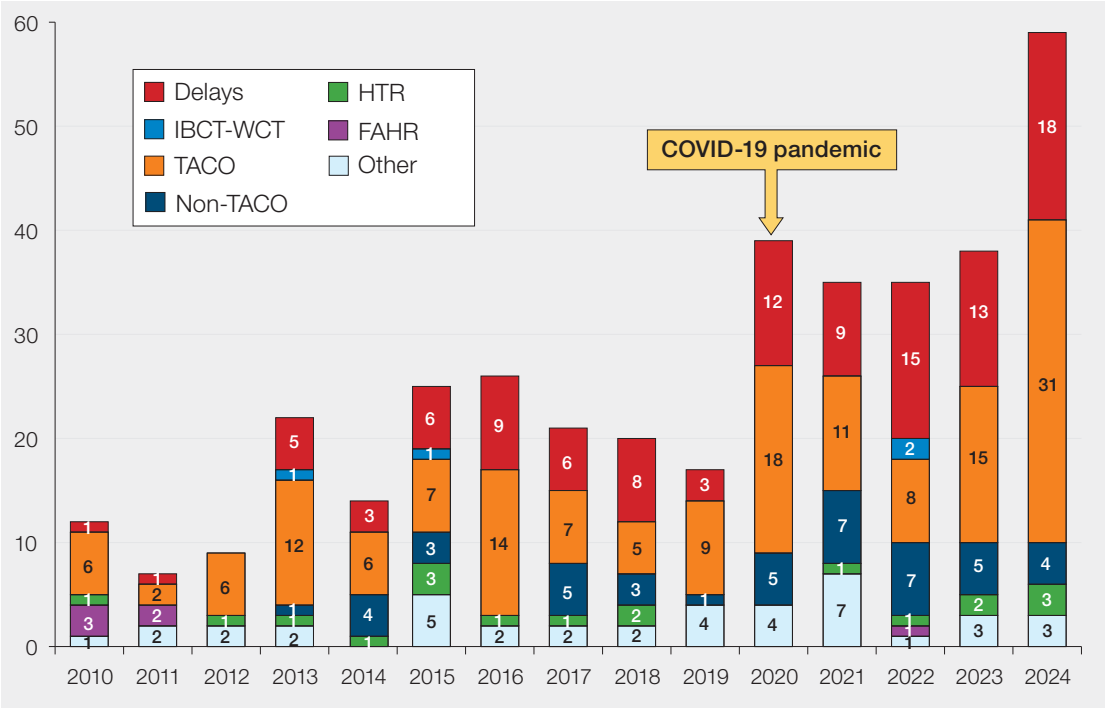


Figure 3.5 shows the trend in the transfusion-related deaths reported to SHOT since 2010 by category. It is alarming to note an increasing trend in the deaths reported especially related to transfusion delays and pulmonary complications, with a further steep rise in 2024 due to TACO deaths. While this could potentially be due to improved awareness and reporting following the national patient safety alert for TACO released in April 2024 (MHRA and SHOT, 2024), this could also be a true increase reflecting the worsening challenges faced in healthcare as described earlier. This worrying trend continues despite the release of UK-wide national patient safety alerts addressing preventable transfusion delays and TACO in recent years. This is most likely reflecting the ongoing systemic issues including inadequate staffing levels and suboptimal IT that are yet to be resolved.

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



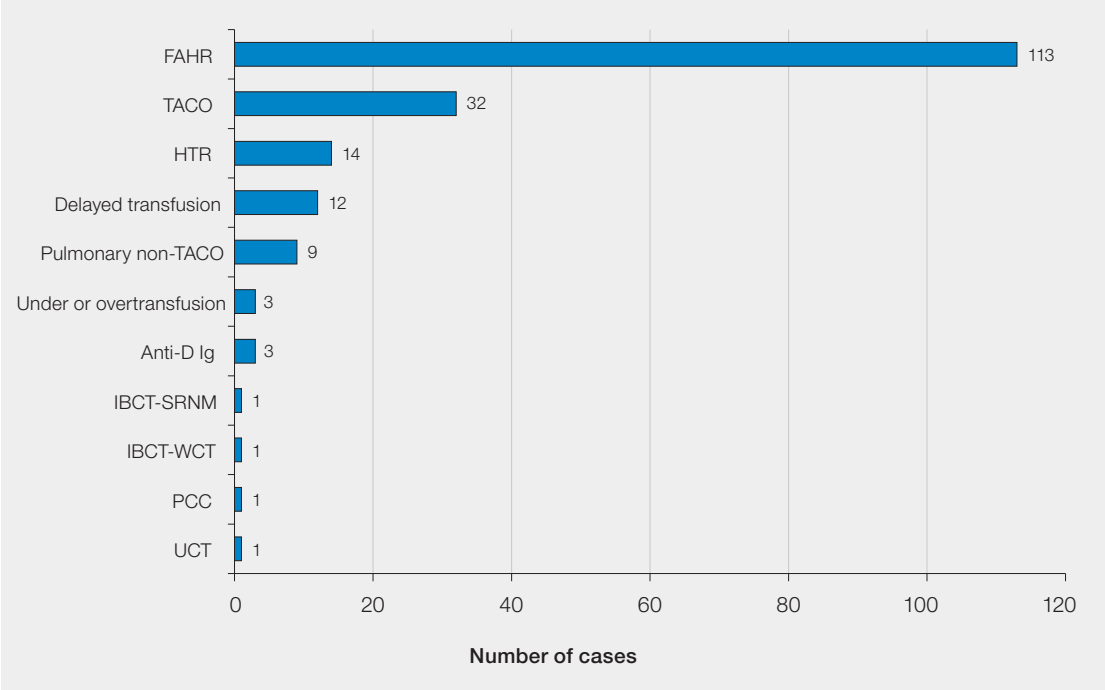
FAHR=febrile, allergic, and hypotensive reactions; HTR=haemolytic transfusion reaction; IBCT-WCT=incorrect blood component transfused-wrong component transfused; TACO=transfusion-associated circulatory overload;

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 11 in the avoidable, over or undertransfusion category, 3 transfusion-transmitted infections, and 23 deaths related to other unclassified reactions

Major morbidity n=190

Febrile, allergic, and hypotensive transfusion reactions continue to account for most of the cases with major morbidity, 113/190 (59.5%) followed by TACO, 32/190 (16.8%). These are detailed further in the respective chapters in this Annual SHOT Report. Major morbidity criteria are outlined in the SHOT definitions document which is reviewed and updated annually.

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

Summary data and risks associated with transfusion

Data collected in 2024 are shown in Figure 3.7. Near miss reports continue to be the largest category, 1408/3998 (35.2%), however, this percentage is steadily reducing from 37.0% in 2023 and 39.0% in 2022. Cumulative haemovigilance data from SHOT between 1996-2024 are shown in Figure 3.8.

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

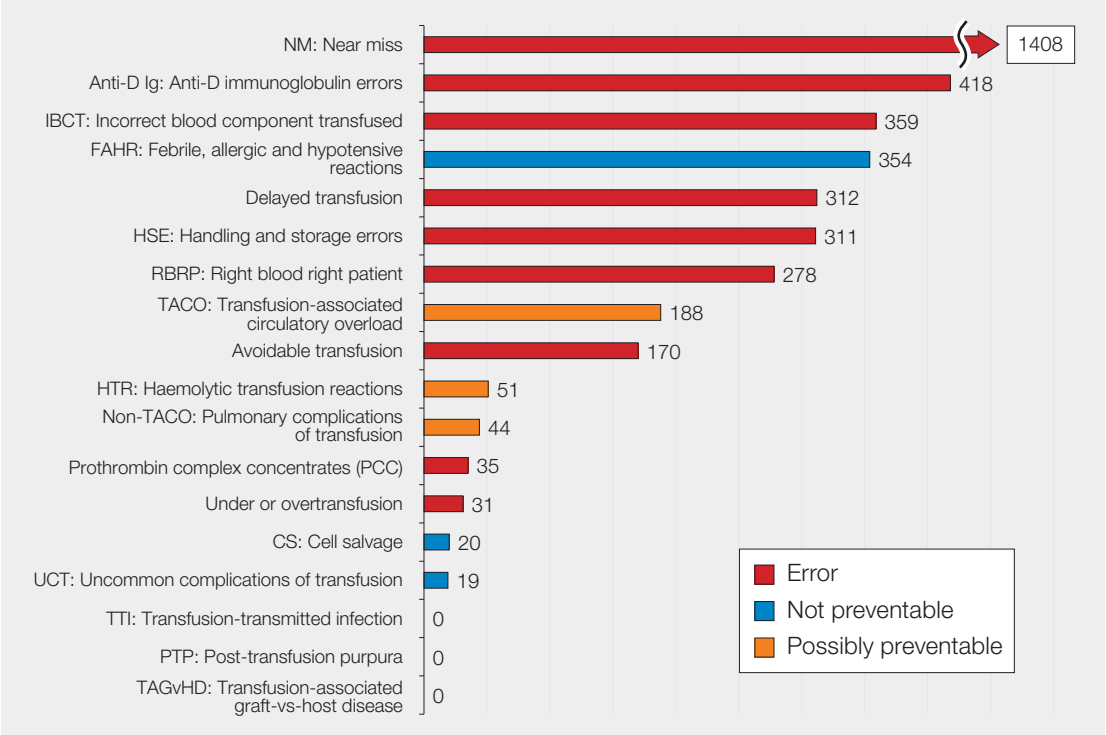
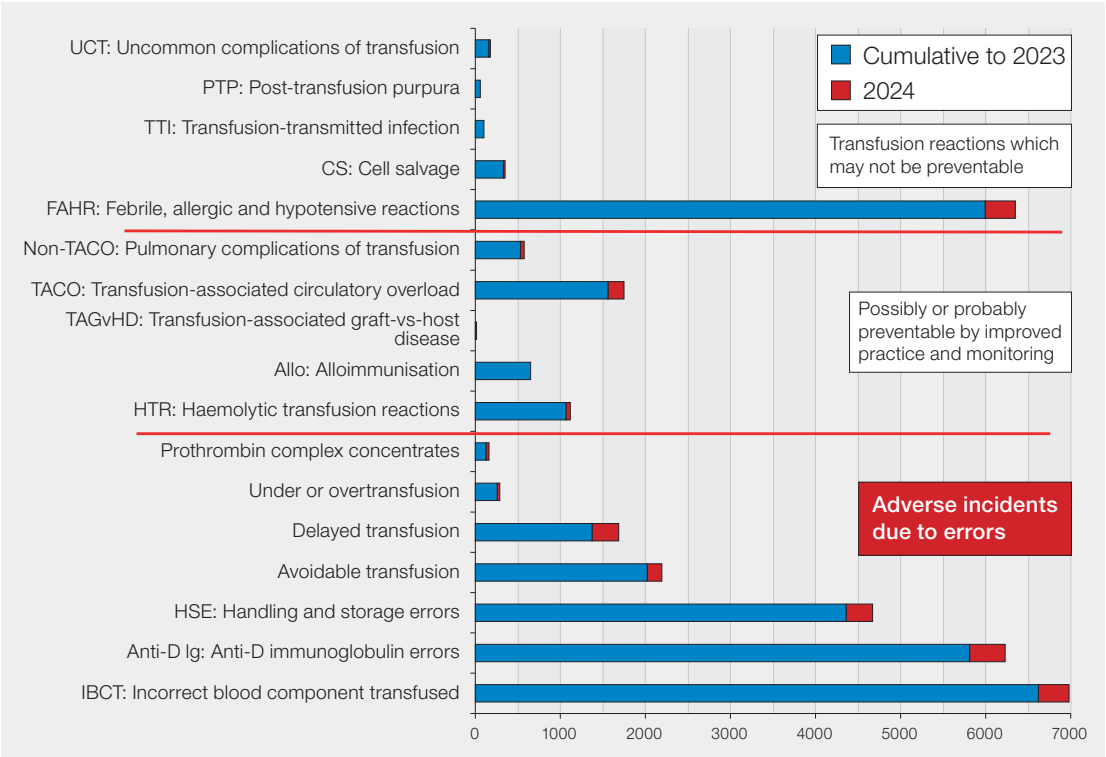


Figure 3.8: Cumulative data for SHOT categories 1996-2024 (n=33343)



Data on alloimmunisation has not been collected by SHOT since 2015

ABO-incompatible (ABOi) transfusions n=4

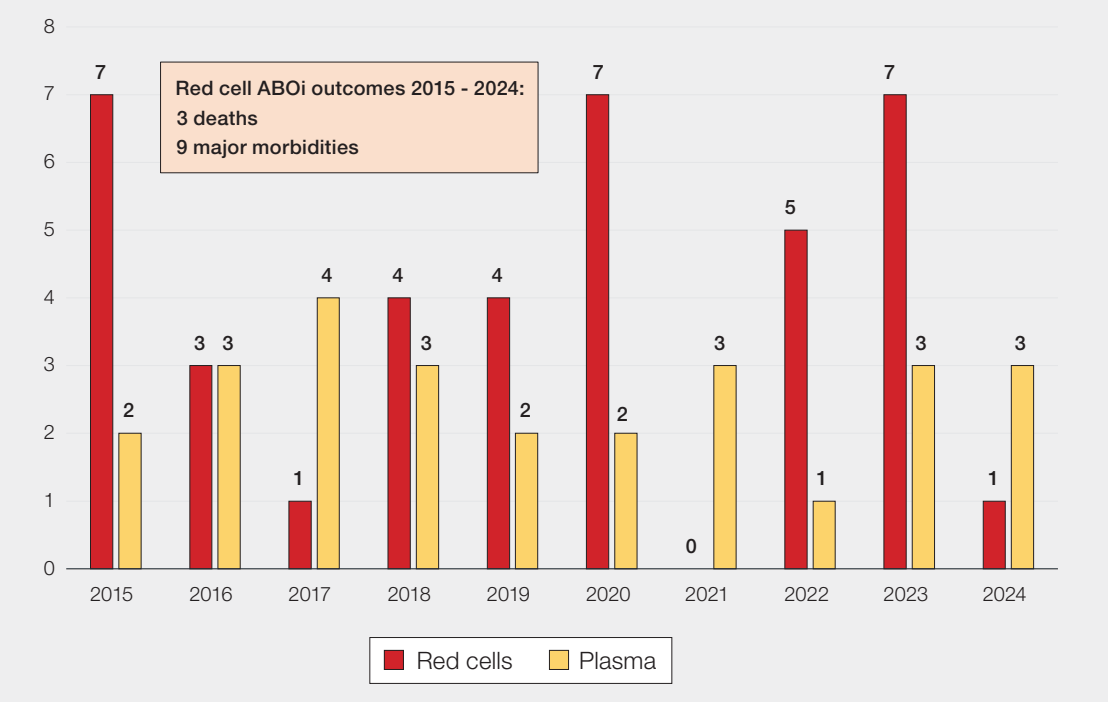
In 2024, there was 1 ABOi red cell transfusion reported and 3 ABOi plasma transfusions. Fortuitously, there were no adverse outcomes in any of the cases reported this year. In the ABOi red cell case, the transfusion was not started, however, as the transfusion was connected to the patient, this fulfils the criteria for a 'transfused' incident and has been included as such.

Of the ABOi plasma transfusions, all 3 were due to component selection errors in the transfusion laboratory, 2 involved FFP, and the 3rd related to SD-FFP.

These cases are explored in more detail in Chapter 10, Incorrect Blood Component Transfused (IBCT) and Chapter 15, Laboratory Errors.

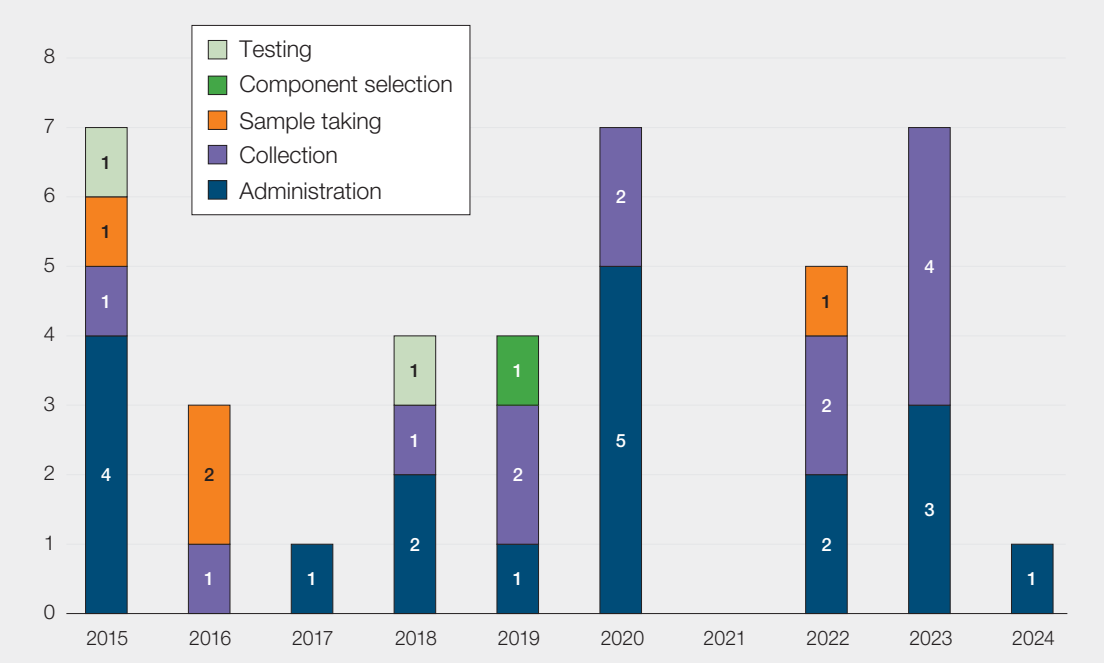
Figure 3.9 shows the number of ABOi red cell and plasma transfusions reported to SHOT in the last decade.

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



A review of ABOi red cell transfusions over the last 10 years shows that most were due to clinical errors, 36/39 (92.3%). In these, the primary error was mostly during either collection of the component (n=13) or administration of the component (n=19) due to the correct checks not being performed at these critical steps.

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



Safety measures in place to prevent ABOi from happening currently include a combination of information technology (IT) and people dependant controls. Several factors contribute to continuing preventable errors including staffing issues, high workload mismatched to staff capacity, poor IT, suboptimal staff training, under-resourced systems and ineffective learning from incidents. A pre-administration safety check is the last step before transfusion when errors can potentially be picked up. There is therefore a requirement for a comprehensive safety check at this step. Checks are ineffective and can fail when carried out inappropriately.

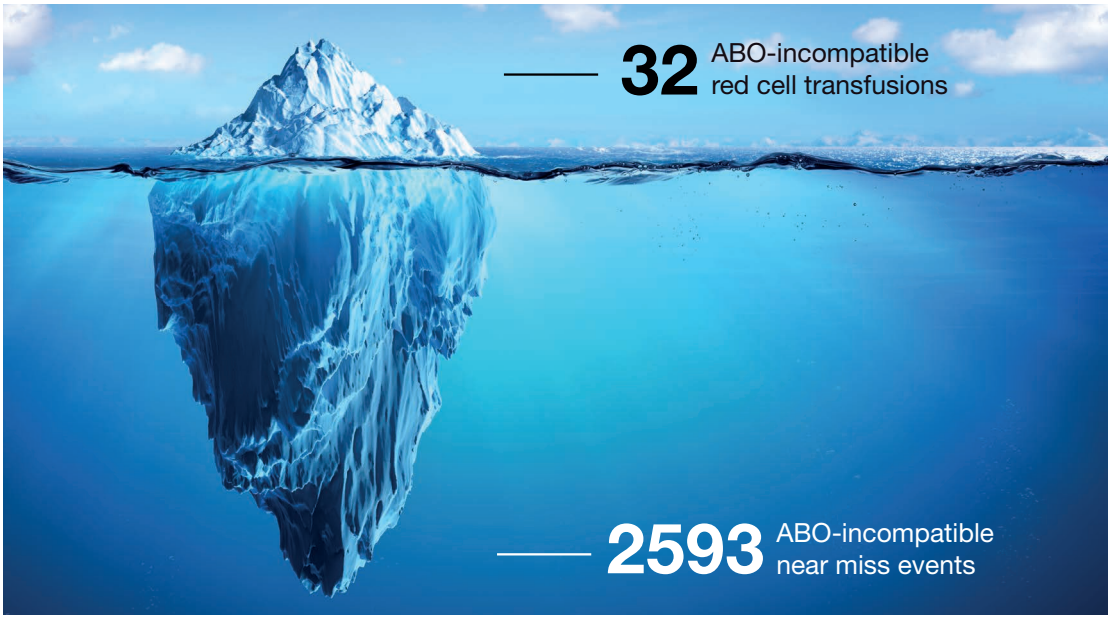
Inadvertent ABOi transfusions are categorised as Never Events in England (NHSE, 2021). The outcome from the NHS England consultation for the Never Events list and framework is still awaited. The main aim was to clarify whether the current framework is an effective mechanism to drive patient safety improvement. Further details can be found at this link: https://www.england.nhs.uk/long-read/never-events-framework-consultation/. SHOT provided input during this consultation supporting review of the framework with continuing inclusion of ABOi events and facilitating appropriate systemic improvements to prevent these.

Despite existing protocols and safety checks, current measures to prevent ABOi transfusions are not fully effective in eliminating this preventable and potentially fatal event. Similar average ABOi frequencies have been observed in France (0.19 [SD:0.09]/100 000 issued red cell units) and in the UK (0.28 [SD:0.17]/100 000) which have different safety measures. A higher frequency (0.71 [SD:0.23]/100 000) was observed in Germany which has similar bedside safety measures to France (Mirrione-Savin, et al., 2025). There is an urgent need to strengthen the safety measures to prevent ABOi transfusions.

Transfusion decisions in haemopoietic stem cell transplant settings, especially with blood group mismatch, are particularly complex due to several factors. Challenges related to ABO and D compatibility exist at multiple phases of the transplant process and the patient's blood group may convert to the donor's blood type over time. Effective management requires close coordination between transplant and transfusion services, both clinical and laboratory, with tailored strategies for different transplant decisions in various phases. These are discussed further in Chapter 28, Transfusion Errors in Transplant Cases.

Data from 2016-2024 show that although there were 32 ABOi red cell transfusions, there were 2593 near misses which could have resulted in an ABOi transfusion. Most of these were WBIT incidents which constitute the largest subset of near miss cases reported to SHOT in 2024, 899/1408 (63.8%), and these are discussed in Chapter 15a, Near Miss – Wrong Blood in Tube (WBIT). It is important to note that these may not be detected routinely unless there is a historical record in the transfusion laboratory and demonstrate the importance of the group-check policy (Milkins, et al., 2013). Such errors could result in patient deaths and highlight the risk of not undertaking positive patient identification at the time of collecting and labelling pre-transfusion samples. As is evident from the iceberg representation below (Figure 3.11), these occur much more frequently and offer more opportunities to learn than the rarer serious adverse events. When WBIT are not identified or investigated, they represent missed opportunities that can contribute to future risks of potentially lethal ABOi. Analysing these incidents helps refine transfusion safety practices, such as patient identification protocols, labelling accuracy and verification processes.

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



Conclusion

Haemovigilance data from 2024 indicates a troubling increase in transfusion-related errors and deaths, signalling deeper systemic issues within healthcare. Transfusion errors are not isolated incidents, they are warning signs of broader challenges in healthcare safety, including communication failures, flawed workflow designs, procedural inconsistencies, poor safety culture and governance gaps.

There is no room for complacency. Immediate steps must be taken to strengthen the workforce, standardise and promote best practices, leverage technology, improve learning, enhance training and accountability.

The continuing trend of a high percentage of preventable errors is a canary in the coalmine; a warning that demands urgent response. Transfusion incidents indicate vulnerabilities in the healthcare system that can impact all aspects of patient care. Leadership at every level must prioritise patient safety and deliver improvement initiatives. Addressing transfusion safety can serve as a gateway to improving overall patient safety.

Recommended resources

SHOT videos: Learning from transfusion related deaths
https://www.shotuk.org/resources/learning-from-transfusion-related-deaths/

Cumulative SHOT Data by Category
https://www.shotuk.org/resources/cumulative-shot-data-by-category/

SHOT Webinar: Every Minute Counts
https://www.shotuk.org/resources/every-minute-counts-webinar-2021/

SHOT Transfusion Safety Standards
https://www.shotuk.org/transfusion-safety-standards/