20b Pulmonary Complications of Transfusion: Non-TACO n=44

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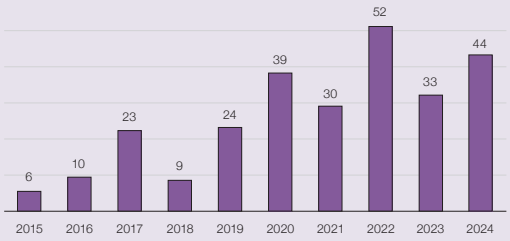
Headline data 2024

Number of reports n=44
Deaths n=4
Major morbidity n=9

Non-TACO reports by year



Demographic data

Male	Female	Adults	Paediatric
n=21	n=23	n=44	n=0

Blood component data

Red cells n=33
Platelets n=3
Fresh frozen plasma (FFP) n=1
Granulocytes n=1
Multiple components n=6

Key findings:

- Excessive fluid contributed to 48% of cases but did not meet transfusion-associated circulatory overload (TACO) criteria
- There was 1 case of antibody-mediated transfusion-related acute lung injury (TRALI)
- At least three comorbidities were identified to have contributed to the reaction in almost 50% of the cases. Hypoxia or raised respiratory rate were identified prior to transfusion in 64% of the cases
- There was 1 case of TRALI following granulocyte transfusion

Gaps identified:

- Insufficient information available to apply international criteria meant that 38% of cases were classified as transfusion-associated dyspnoea (TAD)
- No significant concordance between identification of TACO risk and presence of fluid risks

Good practice:

- Improved rate of TACO pre-transfusion risk assessment completion (66% vs 33% in 2023)
- Diuretic was given in response to reaction in 81% of cases where fluid overload was thought to be likely
- Structured TACO investigation was used in 40% of reports and identified areas for improvement in 71% of cases

Next steps:

- Ensure recommendations from the National Patient Safety Alert: Reducing risks for transfusion-associated circulatory overload (NatPSA/2024/004/MHRA) are fully implemented

For all abbreviations and references used, please see the **Glossary** and **Reference list** at the end of the full Annual SHOT Report. Please see the supplementary information on the SHOT website (https://www.shotuk.org/shot-reports/annual-shot-report-2024/).

Definition:

Cases where there is a respiratory deterioration within 24 hours of transfusion which does not meet International Society of Blood Transfusion (ISBT) TACO criteria, and which is not explained by the recipient's underlying condition.

Introduction

There were 59 cases submitted or transferred from other categories. Thirteen were withdrawn as they were either of insufficient severity or the respiratory deterioration was deemed to be due to the underlying condition, and 2 cases were transferred to TACO.

Cases were classified using the International Revised Consensus (IRC) definitions of TRALI (Table 20b.1). Cases satisfying both TRALI (Vlaar, et al., 2019) and TACO (Wiersum-Osselton, et al., 2018) criteria were categorised as 'TRALI-TACO' and cases satisfying neither as 'TAD'. The TAD category is subclassified into TAD-IC (cases which could not be classified because of incomplete information reported) and TAD-C (cases where there was sufficient information to judge that the case did not meet either TACO or TRALI criteria).

The final classification of cases with imputability is presented in Table 20b.2.

Table 20b.1 International Revised Consensus classification of TRALI (Vlaar, et al., 2019)

TRALI type I - Patients who have no risk factors for ARDS and meet the following criteria:	
a.	i. Acute onset
	ii. Hypoxemia (P/F ≤300 or SpO2 < 90% on room air)
	iii. Clear evidence of bilateral pulmonary edema on imaging (e.g. chest radiograph, chest CT, or ultrasound)
	iv. No evidence of left atrial hypertension (LAH), or, if LAH is present, it if judged to not be the main contributor to the hypoxemia
b.	Onset during or within 6 hours of transfusion
c.	No temporal relationship to an alternative risk factor for ARDS
TRALI type II - Patients who have risk factors for ARDS (but who have not been diagnosed with ARDS) or who have existing mild ARDS (P/F of 200-300), but whose respiratory status deteriorates and is judged to be due to transfusion based on:	
a.	Findings as described in categories a and b of TRALI type I and
b.	Stable respiratory status in the 12 hours before transfusion

Table 20b.2: Final classification of non-TACO cases in 2024

		Imputability			
		1-possible	**2-probable**	**3-definite**	**Total**
Category	TAD-C	13	7	0	**20**
	TAD-IC	9	8	0	**17**
	TRALI-TACO	0	1	0	**1**
	TRALI type II	2	4	0	**6**
Total		**24**	**20**	**0**	**44**

Deaths related to transfusion n=4

There were 4 transfusion-related deaths due to non-TACO pulmonary complications. Of these, 3 were classified as TAD-C (2 with imputability 2, and 1 with imputability 1) and 1 case which was TAD-IC (imputability 2). Additional narrative detail on deaths is available in the supplementary information on the SHOT website.

Major morbidity n=9

There were 9 cases of major morbidity, classified as TRALI type II (n=3), TAD-C (n=4), TAD-IC (n=1) and TRALI-TACO (n=1).

TRALI cases and leucocyte antibody cases n=7

There was 1 case associated with leucocyte antibodies. In 4 other cases, donors were recalled for antibody testing. Testing was negative in 2 cases and donors failed to respond in 2 cases.

Case 20b.1: TRALI type II associated with granulocyte antibody of undetermined specificity in a donor

A patient with history of ischaemic heart disease and pulmonary embolus underwent laparotomy 2 days after caesarean section because of bleeding. Low albumin and raised C-reactive protein were present prior to surgery. The patient became haemodynamically unstable with a haemoglobin of 55g/L and was transfused four units of red cells, four units of plasma and 4L of crystalloid. The patient developed respiratory deterioration 2 hours after transfusion, and despite a 4L diuresis, continued to deteriorate. Non-invasive ventilation was required, and the patient improved after 48 hours. Chest X-ray showed progressive bilateral pulmonary oedema.

Donor antibody testing showed one donor with IgG reactivity against 4/5 granulocyte panels but negative human leucocyte antigen (HLA) antibodies and reactivity against lymphocytes. A human neutrophil antigen (HNA) specificity could not be determined, and monoclonal antibody immobilisation of granulocyte antigens assay (MAIGA) testing was also negative.

This case met the criteria for TRALI type II. The history and subsequent clinical course were fairly classical for an antibody-mediated TRALI although the haemorrhagic shock is itself a sufficient explanation for acute respiratory distress syndrome. Inflammation, intravenous fluids, and low albumin are other contributory insults.

The donor serology indicates antibody to a granulocyte-specific antigen outside of the recognised HNA systems. A causative relationship could not be proven and a granulocyte crossmatch to prove that the antibody was reactive with recipient cells was impractical.

Case 20b.2: TRALI type II - therapeutic effect of granulocytes

A patient with neutropenic sepsis already on antifungals and broad-spectrum antibiotic developed fever, rigors and respiratory deterioration following a first granulocyte transfusion. The chest X-ray showed patchy bilateral consolidation which was not present before transfusion. The patient required mechanical ventilation for 1 day but then improved.

Respiratory and febrile deteriorations following granulocytes are common. In many cases this represents the intentional immune response of the transfused granulocytes. This case was classified as 'TRALI type II' given the temporal response to transfusion and bilateral imaging changes although it could be argued that the respiratory state was not 'stable' prior to transfusion. Leucocyte antibody testing of donors was not performed and would be unlikely to be informative due to the large number of donors contributing to the granulocyte pools.

Conclusion

As in previous Annual SHOT Reports, many patients included in the non-TACO category were unwell prior to transfusion. Most cases had signs of cardiorespiratory stress prior to transfusion: where appropriate data was supplied, 15/38 (39.5%) were tachycardic and 18/28 (64.3%) were hypoxic or had a raised respiratory rate prior to transfusion.

The median number of pathophysiological factors which could have contributed to the reaction was 3. Inflammatory factors were common, present in 33/44 (75.0%) of cases. As in previous years, many cases had features of fluid overload; 30/44 (68.2%) of cases were considered at risk of fluid overload and 21/44 (47.7%) of reports were considered likely to be caused by fluid overload but did not meet full TACO criteria.

Providing data necessary for classification remains challenging, resulting in the high proportion of cases classified as TAD-IC. There does appear to have been a higher use of the TACO pre-transfusion risk assessment in 2024. A risk assessment was performed in 31/47 (66.0%) cases where data was provided, compared to approximately a third in 2023. However, the risk assessment only identified a fluid risk in 3/11 cases where data was provided, and the data reported to SHOT indicated that a risk of fluid overload was present.