**Time to refine transfusion-associated circulatory overload (TACO)**

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**Objectives**

TACO is the most common cause of death and serious harm reported to SHOT. Current definitions of TACO are unsatisfactory. Work continues across the international haemovigilance community to agree on diagnostic criteria that may be applied to assign a level of diagnostic likelihood.

**Method**

TACO reports to SHOT in 2015 (78) were assessed by two individuals using two definitions: Clinical Prioritisation of Key Features (CPKF) and the Draft revised International Society of Blood Transfusion criteria (DISBT) (Fig 1), to understand inter-assessor variability and to identify issues with the current criteria.

### CPKF

- Acute respiratory distress (in the absence of other specific causes)
- Acute or worsening pulmonary oedema on imaging
- Evidence of a positive fluid balance
- Evidence of volume intolerance (response to treatment for circulatory overload or evidence of pulmonary oedema on clinical examination)

TACO was considered to be 'highly likely' with three or more features, or acute respiratory distress with pulmonary oedema on imaging; 'probable' with acute respiratory distress and clinical improvement with diuretic therapy (volume intolerance); and 'possible' with acute respiratory distress with evidence of a positive fluid balance.

### DISBT

Acute or worsening respiratory distress within 6 hours of transfusion (some cases may occur up to 12 hours)

**Primary features:**

- Evidence of acute or worsening pulmonary oedema with bilateral infiltrates
- Enlarged cardiac silhouette on imaging – enlarged heart contour should always be present if looked for
- Evidence of fluid overload – could be positive fluid balance or a response to diuretic therapy combined with clinical improvement

**Supporting features:**

- Elevated brain-natriuretic peptide (BNP) or N-terminal (NT) pro-BNP to more than five times the pre-transfusion value (if available)
- Increased mean arterial pressure (MAP). MAP = $\frac{1}{3} (SBP - DBP)$ or, increased pulmonary wedge pressure. The MAP is typically raised, often with a widened pulse pressure. There may be hypotension in acute cardiac collapse.

**Results**

There was a high level of concordance for 67/78 assessments (complete agreement or minor discrepancies). The level of significantly discrepant assessments (11/78) highlighted issues with interpretation and application of existing criteria (Fig 2). These cases were assessed by panel review which demonstrated that the clinician assessor was more flexible in application of the criteria than the clinical scientist. The reasons for all discrepant assessments were agreed justifiable.

The current criteria may not be sufficiently sensitive or flexible to account for the impact of incomplete history or investigations (or serial investigations for comparison), and for the presence of confounding medical factors in some cases. For example the DISBT criteria include imaging of cardiac silhouette and BNP/NT-pro BNP assays which are not usually performed in the UK. This limits the DISBT analysis resulting in some cases having the likelihood of TACO reduced despite an overall persuasive picture.

**Conclusion**

Diagnostic assessment could be finessed by weighting the strength of evidence from a particular clinical finding, and accounting for confounding factors (Fig 3). A logic-based application was developed which calculated the likelihood of TACO based on the presence of weighted symptoms and signs across four diagnostic categories to produce an aggregated score (Fig 4). The application requires further development and will require updating to reflect the final agreed ISBT diagnostic assessment criteria, but may be a useful tool in the future to facilitate reproducible and standardised diagnostic likelihood assessments for cases of TACO.