

Transfusion-associated circulatory overload (TACO)

Definition (2018)

*International Society of Blood Transfusion
Working Party on Haemovigilance*

*in collaboration with
The International Haemovigilance Network*

And AABB (formerly the American Association of Blood Banks)

The 2018 definition represents a revision of the previous international TACO definition published by the International Society for Blood Transfusion Haemovigilance working party and International Haemovigilance Network:

http://www.isbtweb.org/fileadmin/user_upload/Proposed_definitions_2011_surveillance_non_infectious_adverse_reactions_haemovigilance_incl_TRALI_correction_2013.pdf



Rationale for the revision

At the Amsterdam meeting of the ISBT haemovigilance working party (2013), a number of members requested revision of the TACO definition. Notably, strict application of the definition led to non-acceptance of cases which would be accepted as TACO by clinicians and by some haemovigilance systems.

A draft revised definition was circulated in December 2014 and tested by contributors from haemovigilance systems in several countries and continents by applying it to their own cases. This definition was found to give a slightly higher agreement but was limited by the weight placed on enlargement of the cardiac silhouette and increase of brain-type natriuretic peptide (BNP) – both are often not investigated or not recorded in haemovigilance reports.

Further work by the revision group yielded the 2016 draft which was presented at the ISBT and AABB meetings and posted for public comment. The resulting (2017) draft revised definition was subjected to validation in two phases in 2017 (Lancet Haematology, 2019) which led to minor adjustments, incorporated in this revised (2018) TACO surveillance case definition. For distinguishing between TACO and other respiratory complications of blood transfusion, the core criteria (A-E) are inadequate and specific features should be considered carefully (see Table).

At this time the chief priority is to adopt a standard definition which will enable professionals to raise awareness of TACO and lead to improved reporting, research and reduction of transfusion complications. The revision group thanks all who contributed at the different stages of the development of this revised definition. In future, the criteria may need to be adjusted in the light of accumulating evidence.

The revision group

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The revision group (listed alphabetically, including past members)

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Transfusion-associated circulatory overload (TACO) surveillance case definition (2018)

Context

- The term transfusion-associated circulatory overload or TACO indicates that there is a *temporal* association with blood transfusion. The imputability, the *causal* contribution of the transfusion, is assessed separately.
- Certain clinical conditions, e.g. cardiovascular, renal, pulmonary diseases and severe anemia, are risk factors for TACO. These conditions do not preclude a diagnosis of TACO.
- Other fluids given before or around the time of the transfusion contribute to and can exacerbate the fluid challenges posed by transfusion. The volume of transfused products may constitute only a percentage of fluids administered overall.
- Patients with TACO cardinaly manifest respiratory system-related signs and symptoms such as tachypnea, dyspnea, and decreased oxygen saturations, typically occurring during or within 12 hours of transfusion.
- Close monitoring of the patient and the vital signs during transfusion are important; review of vital sign values/net fluid balance for at least 24 hours prior to the transfusion of the unit identified with the reaction may be of value.
- An increase of blood pressure and tachycardia may be warning signs; appropriate clinical management may prevent development of TACO.
- Radiographic chest imaging of adequate quality or another form of non-invasive assessment of cardiac function at the time of the reaction is an important means of gaining diagnostic information and should be considered. However, cases without chest imaging may be reported as TACO providing other features are present.
- Patients with TACO may experience an increase in body temperature. An increase of body temperature should be investigated according to protocol and clinical judgement. Increased body temperature does not exclude TACO if the reporting criteria are met.
- Patients receiving ventilatory support: In ICU patients who may be receiving varying degrees of PEEP (positive end expiratory pressure) ventilatory support, pulmonary oedema may be difficult to diagnose at higher PEEP settings with TACO becoming apparent only if PEEP settings are reduced or ventilation is discontinued.

TACO reporting criteria*

Patients classified with **TACO (surveillance diagnosis)** should have acute or worsening respiratory compromise and/or evidence of pulmonary oedema (A and/or B below) during or up to 12 hours after transfusion and presence of a total of 3 or more of the criteria below:

- A. Acute or worsening respiratory compromise (see Note 1)
- B. Evidence of acute or worsening pulmonary oedema based on:
 - clinical physical examination (see Note 2), *and/or*
 - radiographic chest imaging and/or other non-invasive assessment of cardiac function e.g. echocardiogram (see Note 3)

- C. Evidence for cardiovascular system changes not explained by the patient's underlying medical condition, including development of tachycardia, hypertension, widened pulse pressure, jugular venous distension, enlarged cardiac silhouette and/or peripheral oedema (see Note 4)
- D. Evidence of fluid overload including any of the following: a positive fluid balance; response to diuretic therapy e.g. from diuretic therapy or dialysis combined with clinical improvement; and change in the patient's weight in the peri-transfusion period (see Note 5)
- E. Supportive result of a relevant biomarker e.g. an increase of B type natriuretic peptide level (e.g., BNP or NT-pro BNP) above the age group-specific reference range and greater than 1.5 times the pretransfusion value. A normal post-transfusion NP level is not consistent with a diagnosis of TACO; serial testing of NP levels in the peri-transfusion period may be helpful in identifying TACO.

*These criteria establish a surveillance case definition based on a complete description of an event, including information that becomes available well after onset. This is for reporting and tracking purposes and the criteria do not constitute clinical diagnosis for the purpose of real-time clinical interventions.

If a case could be TACO according to clinical judgement but fewer than three criteria are met based on available information, the listed criteria can guide collection of additional details e.g. from case notes or discussion with clinical staff. The table below summarises characteristics of TACO, TRALI and TAD to support differential diagnosis.

Notes

1. Respiratory compromise could be manifested by tachypnoea, shortness of breath, cyanosis and decreased oxygen saturation values in the absence of other specific causes; bronchospasm or wheezing can occur.

2. Clinical findings could include crackles on lung auscultation, orthopnea, cough, a third heart sound and pinkish frothy sputum in severe cases.

3. Diagnostic radiographic imaging

Findings consistent with pulmonary oedema from circulatory overload include presence of new or worsening pleural effusions, widened vascular pedicle, progressive lobar vessel enlargement, peribronchial cuffing, bilateral Kerley lines, alveolar oedema with nodular areas of increased opacity and/or cardiac silhouette enlargement.

4. Blood pressure monitoring

Often the arterial pressure is raised, often with widened pulse pressure; however hypotension may be a presenting feature, e.g. in patients in a state of acute cardiac collapse.

Blood pressure should be monitored especially if multi-unit transfusions are given.

5. Change in the patient's weight

Typically the patient's weight will increase. However there may be a decrease following diuretic therapy.

Imputability

The imputability, the *causal* contribution of the transfusion, is assessed separately.

Table: Comparison of Characteristics of Respiratory Adverse Transfusion Reactions

	TACO	TRALI	TAD*
1. Respiratory Compromise	Yes	Yes	Yes
2. Risk Factors	CV/Renal/Pulmonary Disease	Direct Lung Injury (Aspiration, Pneumonia, Toxic inhalation, Lung contusion, Near drowning) Indirect Lung Injury (Severe sepsis, Shock, Multiple trauma, Burn injury, Acute pancreatitis, Cardiopulmonary bypass, Drug overdose) Donor Antibodies to HLA/HNA may be found (incompatible with recipient HLA/HNA)	Unknown
3. Pulmonary Oedema	Yes	Yes	Unknown
Crackles on auscultation	Yes	Yes	Unknown
Wheezing	May occur	May occur	Unknown
Diagnosis clinically supported if	Orthopnoea Raised jugular venous pressure Frothy sputum in severe cases (may be pinkish)	Copious frothy sputum (typically pinkish)	Unknown
White lung fields on Imaging	Yes	Yes	Unknown
Enlarged cardiac silhouette and/or widened vascular pedicle	Likely	No	Unknown
Diagnosis supported if	Kerley B lines, peribronchial cuffing; may be pleural fluid	Typically no pleural fluid	Unknown
4. Onset	During/up to 12 Hrs	During/up to 6 Hrs	During/up to 24 Hrs
5. Positive Fluid Balance	Yes	No	No
6. Diuretic Response	Yes (with clinical improvement)	No	No
7. Elevation of Natriuretic Peptide (NP) Level	Yes (may also be elevated before transfusion)	No/some elevation	Unknown
8. Weight Change	Likely	Unlikely	Unlikely
9. Cardiovascular System Changes	Yes	Possible	Unknown
Tachycardia	Yes	Yes	Unknown
Hypotension	Possible	Likely	Unknown
Hypertension	Likely	No	Unknown
Widened pulse pressure	Likely	No	Unknown
10. Transient WBC Count Decrease	Unknown	Possible	Unknown
11. Temperature Elevation	Possible	Possible	Unknown

*For a classification of TAD, TRALI and TACO must be excluded. Please also see the ISBT-IHN definitions for non-infectious transfusion complications.

Abbreviations:

TACO, Transfusion –Associated Circulatory Overload; TRALI, Transfusion Related Acute Lung Injury; TAD, Transfusion Associated Dyspnoea; CV, Cardiovascular; HLA, Human Leukocyte Antigens; HNA, Human Neutrophil Antigens; Hrs, Hours; WBC, White Blood cell count