TACO Update
SHOT Symposium 2018

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TACO Updates

• Revision of the TACO surveillance definition

• Use of BNP/NT-Pro-BNP testing

• SHOT Key Messages for TACO

• SHOT Recommendations for TACO

• National Comparative Audit of TACO (2017)
Revision of the TACO Surveillance Definition

- **2011**: Surveillance Definition Published by ISBT/IHN
- **2013**: Revision required – insufficient inclusivity for some HV systems
- **2014**: 1st revised draft proposed
- **2015**: Improved inclusivity but not yet optimised
- **2017**: Case reports assessed using proposed criteria**

**Phase 1**
- Previously assessed pulmonary cases ‘v’ current criteria*

**Phase 2**
- 2nd Draft posted for public comment
- Case reports assessed using proposed criteria**

**Phase 3**
- 6 additional versions developed. Final version was highest sensitivity and specificity

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*current TACO, TRALI and TAD criteria
**proposed TACO, current TRALI and TAD criteria

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State of Research Symposium for TACO and TRALI, October 2018.
2017 Draft TACO Surveillance Criteria

Acute or worsening respiratory compromise during or up to 12 hours after transfusion and should exhibit **two or more** of the criteria below:

1. Evidence of acute or worsening **pulmonary oedema** based on:
   1. clinical physical examination, *and/or*
   2. radiographic chest imaging and/or other non-invasive assessment of cardiac function

2. Evidence for **cardiovascular system changes** not explained by the patient’s underlying medical condition, including tachycardia, hypertension, jugular venous distension, enlarged cardiac silhouette and/or peripheral oedema

3. Evidence of **fluid overload** including any of the following: a positive fluid balance; response to diuretic therapy combined with clinical improvement; and change in the patient’s weight in the peri-transfusion period

4. Elevation in **B type natriuretic peptide** (NP) levels (e.g., BNP or NT-pro BNP) to greater than 1.5 times the pretransfusion value. A normal post-transfusion NP level is not consistent with a diagnosis of TACO; serial testing in the peri-transfusion period may be helpful in identifying TACO.
Both clinically compelling (development of pulmonary oedema following transfusion)
Both lacked unanticipated cardiovascular changes
No fluid balance
Not treated with diuretics/failed to respond to diuretics
BNP not tested
Brain Natriuretic Peptide Testing

• 1-2% TACO reports to SHOT have BNP level
• Regulates blood pressure and blood volume
• Total BNP – less stable/4 hours (EDTA sample)
• NT-Pro-BNP – more stable, most biochemistry platforms (serum or EDTA sample)
• Most labs will perform as part of primary care heart failure diagnostic service, or will be able to refer tests
• Investigation of TACO = very small number
Interpretation of BNP Level

**BNP Reduced**
- Obesity (BMI >35)
- Diuretics
- ACE inhibitors
- Angiotensin receptor blockers
- Flash pulmonary oedema (if sample obtained in first hour)

**BNP Raised**
- Congestive heart failure (chronic heart failure, circulatory overload)
- Renal failure
- LV hypertrophy
- Myocarditis
- Kawasaki disease
- Primary pulmonary hypertension
- Ascitic cirrhosis
- Primary aldosteronism
- Cushing syndrome
- Digoxin and some beta blockers

https://fpnotebook.com/cv/lab/BrnNtrtcPptd.htm
BNP to Support TACO Surveillance Diagnosis

• Non-cardiac comorbidities and pre-existing cardiac disease can raise BNP (scale change is important)
• >1.5x increase from pre-transfusion value supports TACO
• Post-transfusion BNP in normal range is not compatible with TACO (good negative predictor)
Key SHOT message

- Patients who develop respiratory distress during or up to 24 hours after transfusion where transfusion is suspected to be the cause must be reported to SHOT. The transfusion-associated circulatory overload (TACO) definition criteria can be used as guidance but this should not be restrictive. SHOT experts can transfer cases between categories.

National Comparative Audit TACO (2017)

- 64% (69/107) inpatients had TACO suspected when respiratory distress was present.

- 76% (16/21) inpatients developing features of TACO were treated with a diuretic/nitrates/morphine.

- 27.3% (3/11) of TACO cases identified were reported to SHOT.
Recommendation

- A formal pre-transfusion risk assessment for transfusion-associated circulatory overload (TACO) should be undertaken whenever possible, as TACO is the most commonly reported cause of transfusion-related mortality and major morbidity.

Action: All staff authorising transfusion

National Comparative Audit TACO (2017)
20.5% (502/2449) inpatients had a TACO risk assessment performed

- Include a formal pre-transfusion risk assessment for TACO in hospital transfusion policies. The example given in the 2016 SHOT report (SHOT, 2017) is reproduced in Appendix A.

- We recommend the use of a checklist highlighting the following risk factors:
  ✓ Age >50 years
  ✓ Congestive cardiac failure, left ventricular failure or aortic stenosis
  ✓ Chronic kidney disease
  ✓ Liver dysfunction
  ✓ Peripheral oedema
  ✓ Prescription of concomitant IV fluids
  ✓ Pulmonary oedema
  ✓ Undiagnosed respiratory symptoms
  ✓ Use of regular diuretics
  ✓ Weight <50kg
**TACO Checklist**

**Red cell transfusion for non-bleeding patients**

- Does the patient have a diagnosis of ‘heart failure’ congestive cardiac failure (CCF), severe aortic stenosis, or moderate to severe left ventricular dysfunction?
  - Is the patient on a regular diuretic?

- 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 on concomitant fluids (or has been in the past 24 hours)?
  - Is there any peripheral oedema?
  - Does the patient have hypoalbuminaemia?
  - Does the patient have significant renal impairment?

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**If ‘yes’ to any of these questions**

1. Review the need for transfusion (do the benefits outweigh the risks)?

2. Can the transfusion be safely deferred until the issue can be investigated, treated or resolved?

3. Consider body weight dosing for red cells (especially if low body weight)
   - Transfuse one unit (red cells) and review symptoms of anaemia
   - Measure the fluid balance
   - Consider giving a prophylactic diuretic
   - Monitor the vital signs closely, including oxygen saturation

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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.
National Comparative Audit TACO (2017)

- 14% (173/1204) inpatients were assessed after each unit
- 57% (769/1349) of inpatients at risk of TACO had a fluid balance in place
- 11% (236/2175) inpatients at risk of TACO were prescribed a prophylactic diuretic
Recommendation

- Use weight-adjusted red cell dosing to guide the appropriate number of units required for all non-bleeding adult patients, ideally using tools which also highlight inappropriate transfusion (Grey et al. 2018)

Action: All staff authorising transfusion

National Comparative Audit TACO (2017)

- Weigh all patients prior to transfusion (or record an estimated weight if the clinical situation does not allow an accurate weight to be measured). We recommend all patients are weighed no later than 7 days prior to the transfusion.

- In patients at risk of TACO
  - Monitor fluid balance
  - Prescribe one unit at a time and consider prescribing according to body weight
  - Transfuse at a slower rate
  - Consider use of a prophylactic diuretic
  - Monitor the observations closely, including oxygen saturations
  - Review the patient following each unit
Weight-Adjusted Red Cell Dosing

**Clinical Effectiveness**

- 581 Cases 
  (same number of units as recommended by calculator)
- 436 
  (remaining cases after data sorted*)
- 388 (89%) met post-transfusion target Hb
- 24 (5.5%) Exceeded post-transfusion target Hb
- 24 (5.5%) Did not meet post-transfusion target Hb

* No post-transfusion Hb, bleeding, calculated >2 units, received less than recommended by calculator

**Impact on Red Cell Usage**

- ↓ 18%

• Web-App to predict volume of RBC to meet target Hb (non-bleeding adults)
• Limits need for repeat Hb testing (does not negate need for clinical evaluation)
• Personalised PBM
• Controls red cell usage and appropriate use of blood
• See invited poster and SHOT website


Illustrative Case

18b.2 – lack of attention to appropriate red cell dose leads to TACO

• Age 90’s, 75 Kg, new haematological diagnosis, Hb 79g/L
• Comorbidities: heart failure, renal failure, peripheral oedema
• 2 units of red cells with prophylactic diuretic
• 2\textsuperscript{nd} unit: SOB, coughing frothy sputum, bilateral crackles, tachycardia, hypertension
• CXR consistent with pulmonary oedema
Learning

• RCA by reporting organisation: future transfusions slow-rate, diuretic, better fluid balance management

• But...rate was not excessive and diuretics were given

• Dose was not questioned as part of the RCA

• 80g/L target Hb lower range -79g/L pre-transfusion Hb = 1g/L

• 1g/L x 0.4ml x 75Kg = 30ml (<1 unit)

• TACO developed during the 2nd unit

If required post-transfusion Hb target range is 80-100g/L, study* shows that using the lower target for the calculation (i.e. 80g/L in this case) gives best post-transfusion Hb outcome

*A red cell dosage calculator could promote single unit red cell transfusion, prevent over-transfusion and reduce red cell usage (2016).
Thank You