SHOT & TACO

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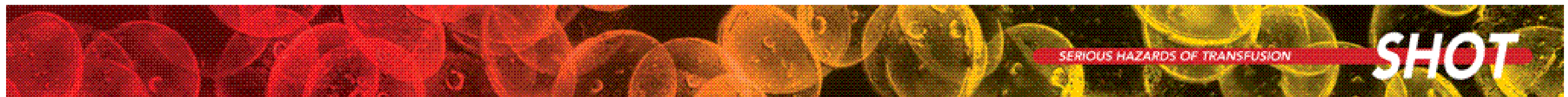
Patient Blood Management Practitioner

NHSBT / SHOT



Haemovigilance definition

- Surveillance procedures from the collection of blood and its components to the follow up of the recipients
- To collect and assess information on unexpected and undesirable effects resulting from the therapeutic use of labile blood components
- ...and aim to prevent their occurrence or recurrence

Haemovigilance in the UK

MHRA	**SHOT**
Medicines & Healthcare products Regulatory Agency	**Serious Hazards of Transfusion**
• Competent Authority' for the BSQR 2005 – QMS in blood establishments and hospital blood banks. • Competent Authority for the Medicines Act 1968 • Competent Authority for the Medical Devices Regulations 2008 • **STATUTORY** reporting	• Confidential enquiry • Serious adverse reactions/events AND near misses all of which occur in BOTH a laboratory and CLINICAL environment. • **PROFESSIONALLY MANDATED** reporting

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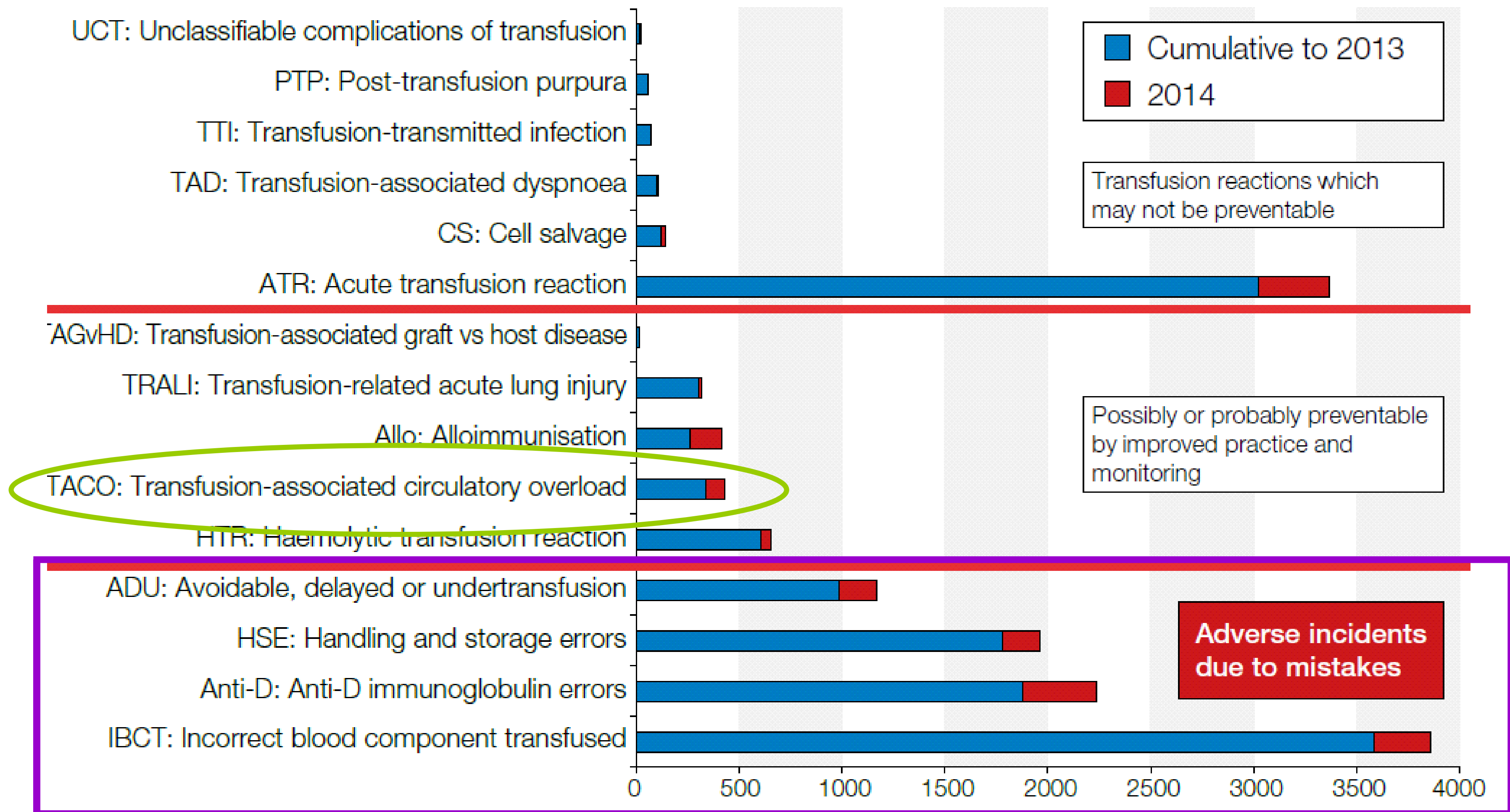
SHOT aims

- IMPROVE
- EDUCATE
- INFLUENCE
- INFORM
- STIMULATE RESEARCH

Cumulative SHOT reports 1996-2014



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SERIOUS HAZARDS OF TRANSFUSION SHOT

Breathlessness and Transfusion

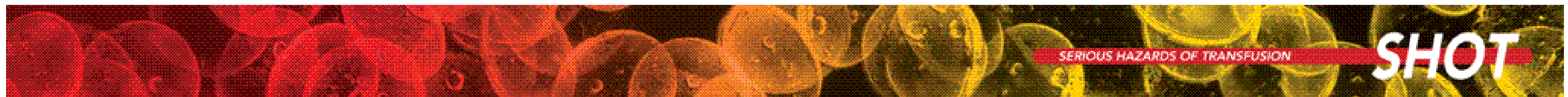
- Transfusion-associated circulatory overload – common and under-diagnosed
- Transfusion-related lung injury – uncommon
- Transfusion-associated dyspnoea – those that don't fit either of the above
- Other: infection, myocardial infarct

What is TACO?   - ISBT definition

"When excess transfusion component volume overwhelms the patient's cardiovascular system resulting in pulmonary oedema"

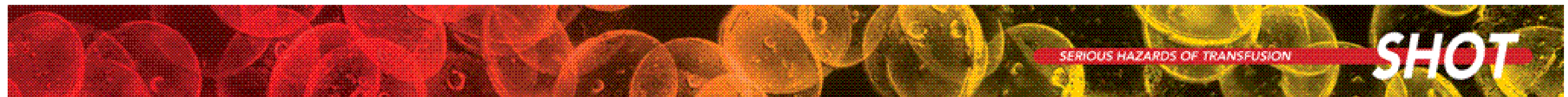
Definitions vary, but usually include any 4 of the following that occur within 6 hours of transfusion:

- Acute respiratory distress
- Tachycardia
- Increased blood pressure
- Acute or worsening pulmonary oedema
- Evidence of positive fluid balance



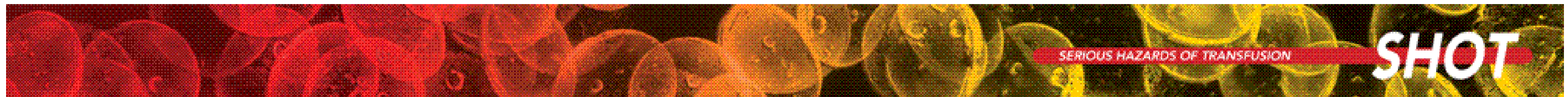
Features of TACO vs TRALI

	TRALI	TACO
Type of component	Usually plasma or platelets	Any
BP	Often reduced	Often raised
Temperature	Often raised	Normal
Echo	Normal	Abnormal
Diuretics	Worsen	Improve
Fluid loading	Improves	Worsens



Mortality/Morbidity data 2014

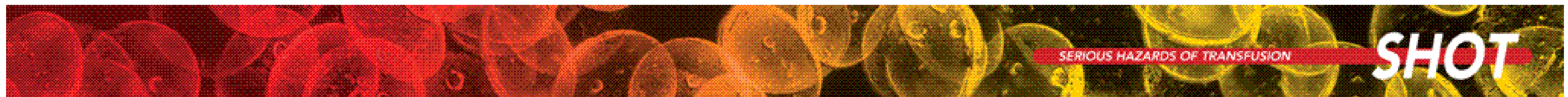
- Acute transfusion reactions
  - 104 cases of major morbidity **(30.3%)**
- Delayed transfusions
  - 3 deaths / 4 major morbidity
- TAD / TRALI
  - 5 deaths / 9 Major Morbidity
- TACO
  - 6 deaths / 36 Major Morbidity (**46.2%)**



Risk factors for TACO

1. Age >70 (56%)
2. Cardiac Failure
3. Renal Impairment
4. Hypoalbuminaemia
5. Fluid Overload
6. Low Body Weight
7. (Children)

Factors 2, 3, 4 & 5 present in 53% cases analysed between 2008 - 2012

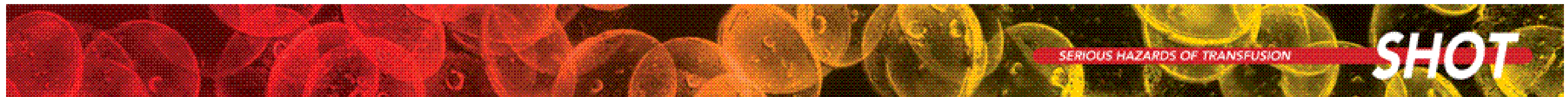


Number of RBC units implicated in TACO

Number of RBC units transfused in the absence of suspected acute haemorrhage 2008-2011

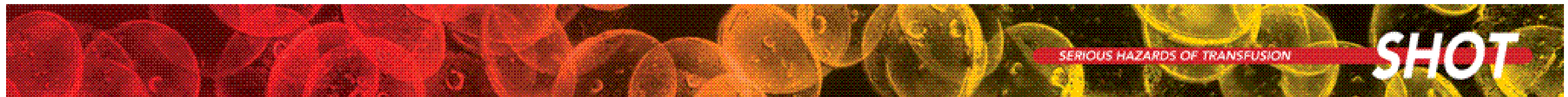
In 86/93 cases (*i.e. where data available*)

- ≤3 units RBC 15 (17.4%)
- ≤ 2 units RBC 49 (57%)
- ≤1 unit RBC 22 (25.6%)



Avoidable transfusion

- 75 yr old man visited at home by GP for unilateral swelling of the leg (Hb 124 g/L three weeks before)
- GP takes sample into syringe and walks 10 mins back to surgery to decant into sample tube
- Hb 76 g/L, so patient (no symptoms of anaemia) admitted overnight as an emergency by on call GP
- Repeat Hb and crossmatch sample at 0640, result available at 0700, Hb 114 g/L
- Transfusion started at 0955 without results review and stopped at 1120 (after 100 mL)

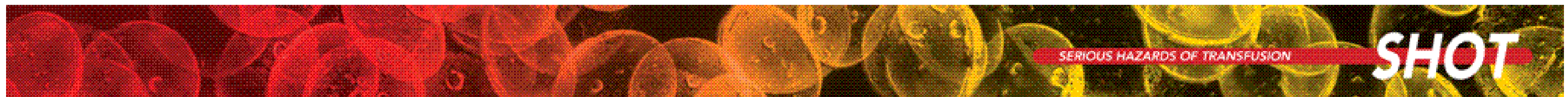


A case of TACO after use of FFP to reverse warfarinisation

- A 61-year-old male patient with an INR of 6.0 required Warfarin reversal prior to elective surgery
- He was given Vitamin K 5 mg and four bags of FFP over 160 minutes
- Without any further INR being performed he then received another three bags over 45 minutes, at which point he became unwell with rigors, chills, wheeze and a temperature of 38.3^{o}C
- His oxygen saturation on air was 80%. He was managed with diuretics and oxygen
- The planned surgery was performed the following day

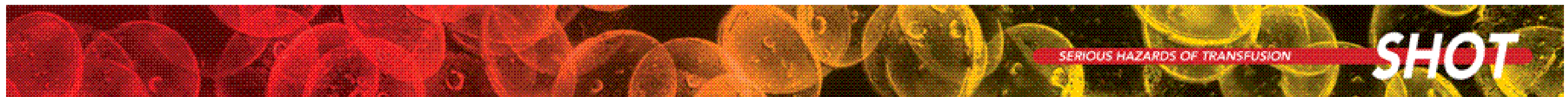
Haemoglobin of 30g/l not queried by medical staff

- A 74 year old male patient in recovery post hip replacement was drowsy, hypotensive and tachycardic
- A haemoglobin estimation from a blood gas analyser was 30 g/L
- A FBC sample was sent to the laboratory, but in the interim 1 unit of uncrossmatched group O D negative blood was commenced
- The Hb result from the laboratory was 112g/L and recovery staff advised medical staff to discontinue the transfusion
- The patient suffered no apparent ill effects as a result of the over-transfusion or uncrossmatched unit, but TACO remains the biggest cause of mortality in SHOT cases



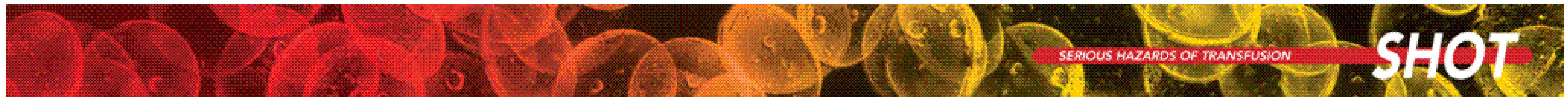
High volume of salvaged blood re-infused

- A 58 year old female patient underwent bilateral knee replacement and blood was salvaged bilaterally from drains postoperatively on HDU
- The policy from the manufacturer of the device and the hospital policy stated that a maximum of 1000ml could be re-infused
- The HDU nurses re-infused 2280mls as they were unfamiliar with the process
- There was no adverse reaction



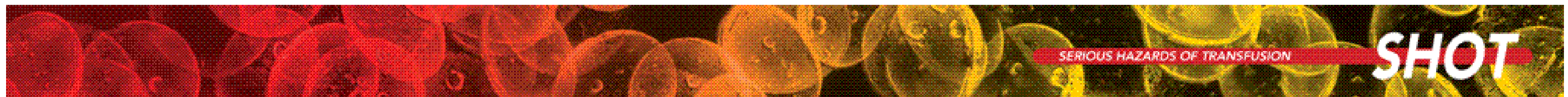
Fatal TACO as a result of transfusion following spurious result

- 96 year old woman admitted with a GI bleed
- FBC sample sent to the laboratory underfilled and gave Hb result of 50 g/L
- Result telephoned to ward and authorised in the computer with a text comment “sample underfilled, result subject to error”
- No repeat sample was sent but a 6 unit crossmatch was ordered
- Three units were transfused and the post-transfusion Hb was 200 g/L
- Patient developed TACO and an emergency venesection was requested but she died the following day



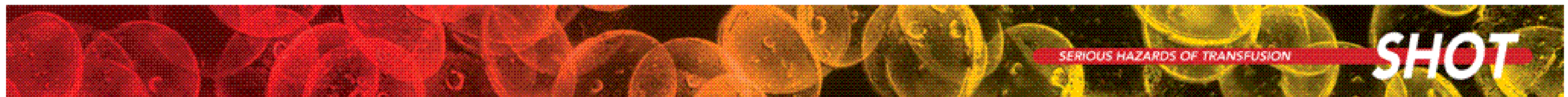
Over-transfusion due to lack of monitoring of response to transfusion

- Elderly patient admitted to the Medical Admissions Unit with haematemesis and initial Hb 106g/L
- No details provided of her observations or the findings on endoscopy but she had further episodes of vomiting blood
- Five units of red cells were transfused before a repeat Hb was performed which was 204 g/L
- The patient was recognised to have circulatory overload and died shortly afterwards



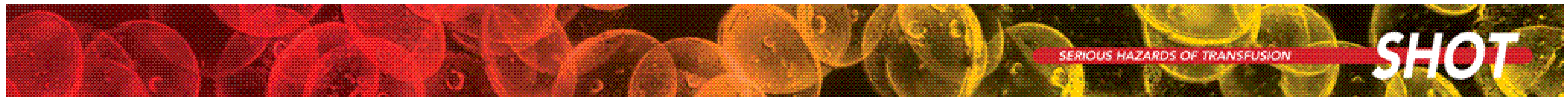
Over-transfusion leading to polycythaemia and a cerebral infarct

- Elderly patient of low body weight (29 kg) admitted with an initial Hb of 70 g/L
- Three units of red cells were prescribed and the post-transfusion Hb was 170 g/L, confirmed with repeat sampling the following day
- She sustained a cerebral infarct 48 hours following the transfusion, which resulted in long-term morbidity



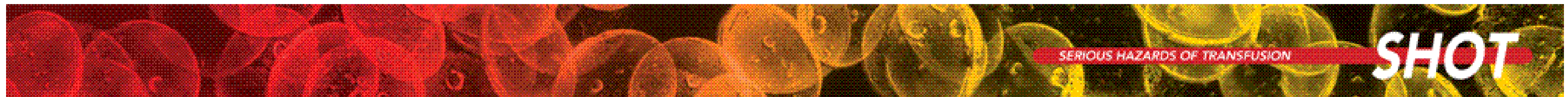
Life-threatening management of iron deficiency

- 82 yr old woman with chronic iron deficiency, Hb 45 g/L
- Transfused 4 units, each over 2.5h
- Developed TACO with tachycardia, hypertension, short of breath etc.
- Intubation, ventilation 2d on ICU
- Made a full recovery



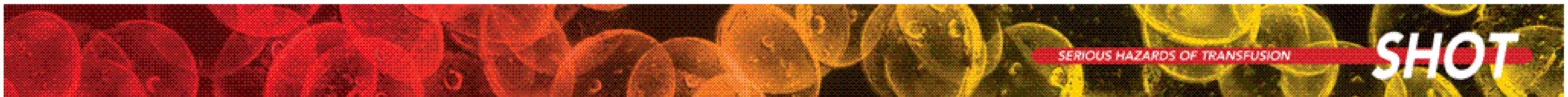
Massive over-transfusion of 1-year-old child

- *A 10Kg child with a gastrostomy inserted a few days previously was brought into A&E, pale but alert, following an episode of vomiting blood - Hb was 98 g/L*
- *He was (wrongly) diagnosed as having an acute arterial bleed, and the major haemorrhage protocol was activated*
- *Red cells were incorrectly prescribed in adult units rather than mL/kg and he was given a total of 4 units (1122 mL), the first 3 given over one hour*
- *He was taken to theatre, found to have no evidence of fresh bleeding in his stomach, and a Hb of 270 g/L*
- *Attempted venesection was difficult and only removed 40 mL blood. He required transfer to a paediatric intensive care unit and made a full recovery*



How can we reduce the risks of TACO ?

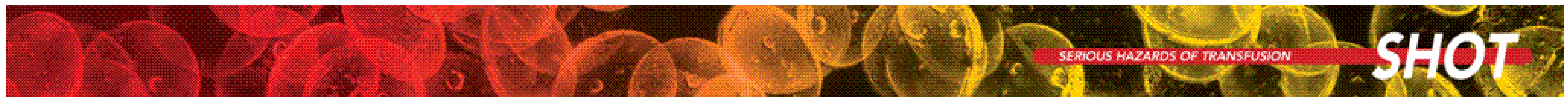
- No verbal orders for transfusion
- Mandatory pre-transfusion risk assessment and volume assessment
- Slow the rate of transfusion – at risk transfusion should be run at 1-2 mL/minute
- Pre-emptive furosemide *before* the transfusion
- 1 unit of RBC at a time (non-bleeding)
- ‘Critical’ nursing supervision



How can we reduce the risk of TACO?

- Appropriate use / Raise awareness
- Monitor patients for 24 hours post-transfusion
- Labs avoid transmitting results that they know or suspect to be inaccurate, but instead request a second sample
- Application of the empirical paediatric formula for low body weight individuals? *Br J Haematol 2001;124:433*

Supplement to BCSH guidelines on blood administration (2009)

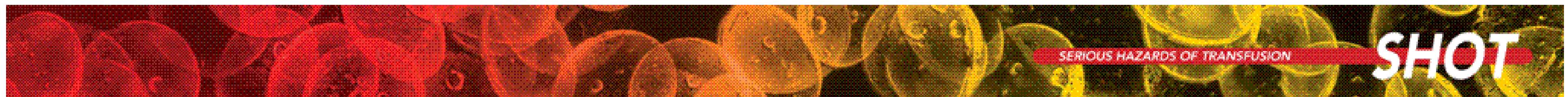


Key Recommendation

Don't give two without review: Transfusion-associated circulatory overload (TACO) is a significant hazard, particularly when elderly or other patients at risk receive several units of blood without review and a check Hb level

*advice inspired by a campaign devised by NHSBT's

Patient Blood Management team



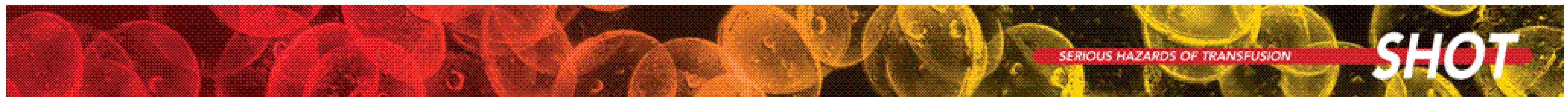
Additional Information

Documents available on website to help with reporting:
www.shotuk.org

- SHOT reporting definitions
- SHOT reporting toolkit
- SHOT Reports & Summaries
- Cases and Figures from the Report
- SHOT 'Bites'

Useful References on TACO:

Popovsky MA, et al. *Immunohematology.* 1996;12(2):87-89.
Robillard P, et al. *Transfusion* 2008; 48 suppl: 204A, 212A
Li G, et al. *Transfusion* 2009; 49: 13-20
Popovsky MA, et al. *Transfusion* 1985; 25: 469



Thanks to;

- Dr Paula Bolton-Maggs
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- Dr Jeannie Callum

  ......for slide content

- **YOU** for listening