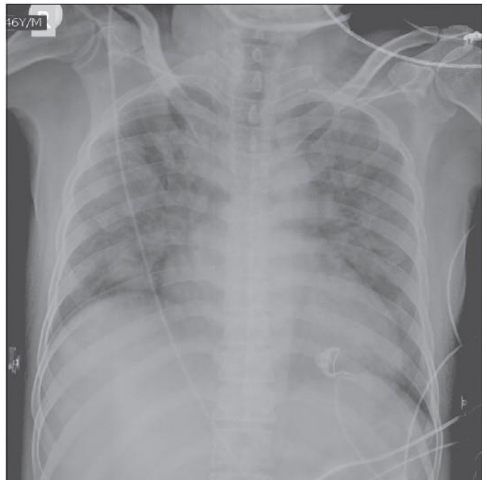


NHS
Blood and Transplant

Transfusion Associated Circulatory Overload (TACO)

Dr Fatts Chowdhury

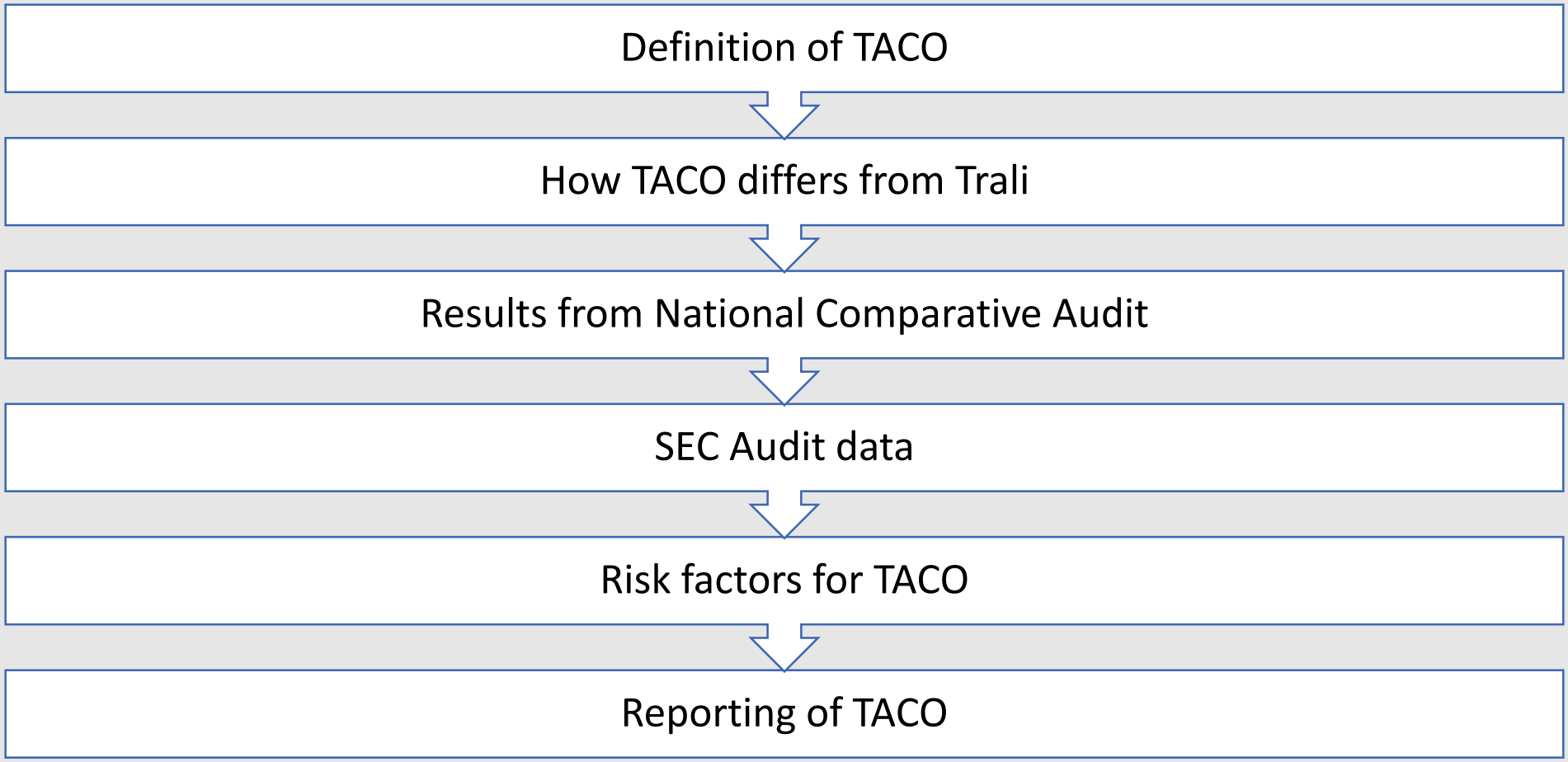
Consultant in Transfusion Medicine

Honorary Senior Clinical Lecturer

NHSBT / Imperial College Healthcare NHS Trust

Objectives

NHS Blood and Transplant



Transfusion Associated Circulatory Overload (TACO)

NHS Blood and Transplant

Definition:

is a *transfusion* reaction that occurs due to a rapid *transfusion* of a large volume of blood

Definition

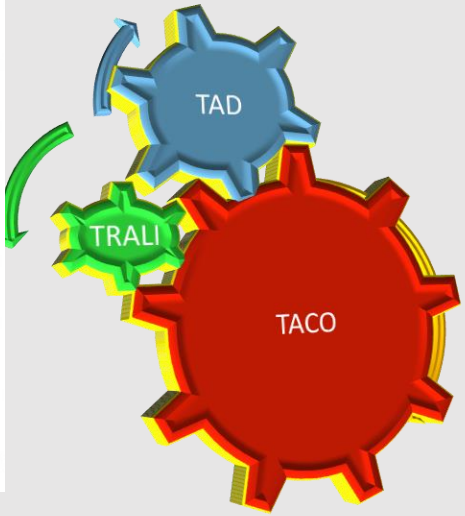
- TRALI is defined as an acute lung injury that is temporally related to a blood transfusion; specifically, it occurs within the first six hours following a transfusion.
- It is typically associated with plasma components such as platelets and Fresh Frozen Plasma, though cases have been reported with packed red blood cells since there is some residual plasma in the packed cells. The blood component transfused is not part of the case definition.

Transfusion associated dyspnea (TAD)

- TAD is characterized by respiratory distress within 24 hours of transfusion that does not meet the criteria of TRALI, TACO, or allergic reaction. Respiratory distress should be the most prominent clinical feature and should not be explained by the patient's underlying condition or any other known cause.

TRALI Vs TACO

TRALI	TACO
• Fever	• No fever
• Hypotension	• Hypertension
• Acute dyspnoea	• Acute dyspnoea
• JVP unchanged	• Can be changed
• Auscultation- rales	• Rales + S3
• X-Ray- diffuse b/l infiltrates	• Diffuse b/l infiltrates
• EF- normal	• Decreased
• Pulmonary edema fluid-exudate	• Transduate
• Response to diuretic-minimal	• Significant improvement



Pulmonary Complications

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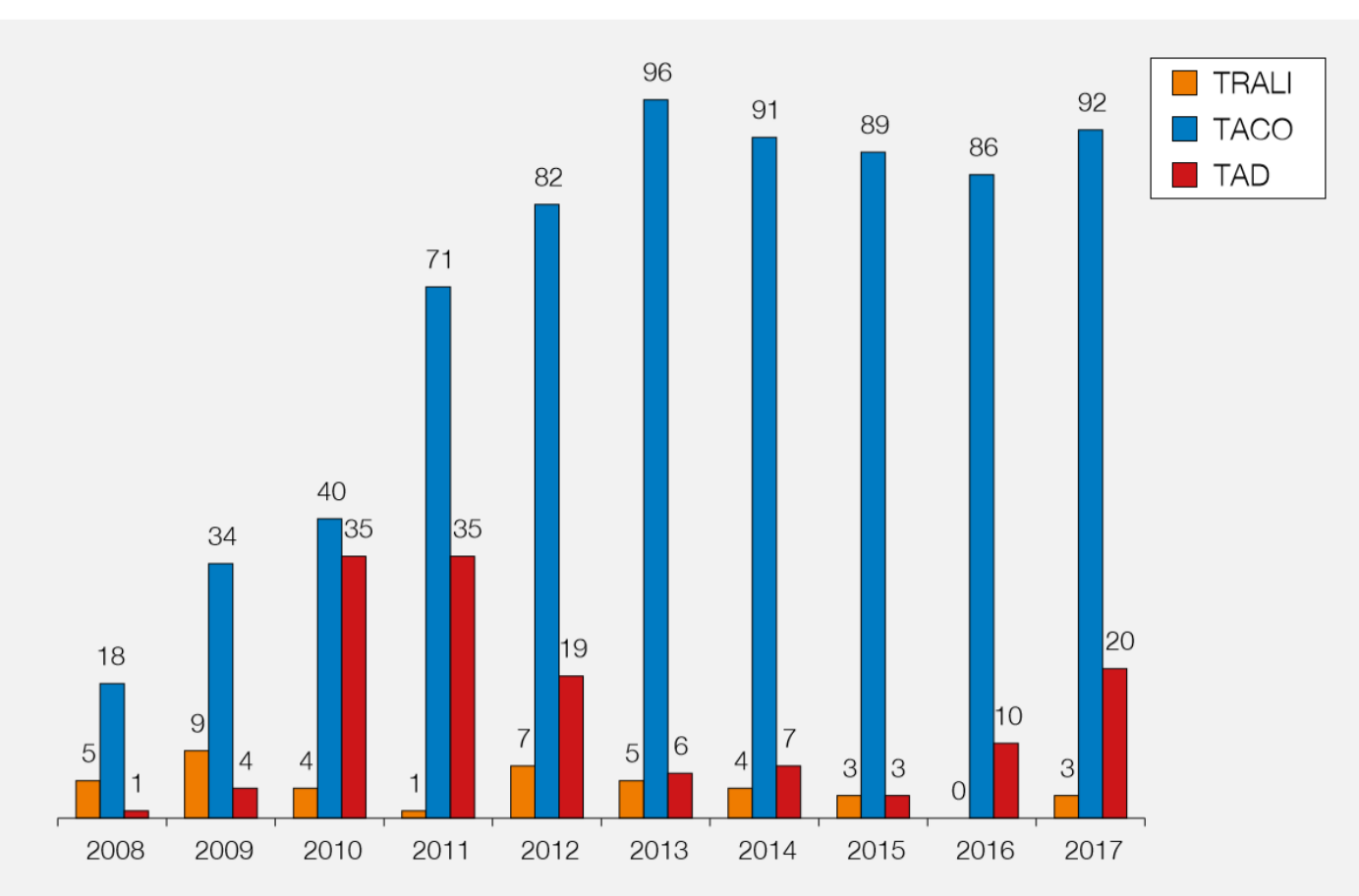

Figure 18.1: Reports of pulmonary complications by year 2010-2017

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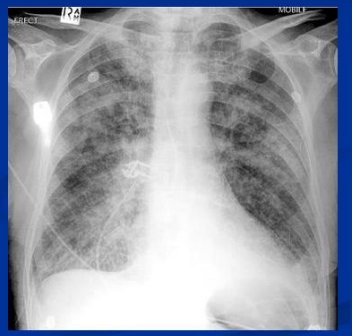
- **Signs and Symptoms**
  - Acute respiratory distress (dyspnea, tachypnea)
  - Elevated systolic blood pressure
  - Jugular venous distension
  - Tachycardia
  - Bilateral pulmonary edema on CXR
  - Symptoms responsive to diuretics



http://en.wikipedia.org/wiki/File:Pulmonary_oedema.jpg

Signs & Symptoms of TACO

National Comparative Audit on TACO

NHS Blood and Transplant

NHS Blood and Transplant

Aims of Audit

Establish whether patients **at risk of TACO** are

- Identified
- Treated with appropriate pre-emptive measures

Establish whether patients **developing TACO** are

- Identified
- Treated appropriately
- Reported

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TACO Audit March & April 2017

157 hospitals participated

2461 inpatients

median age 78 years

4580 patients, all aged at least 60 years

2119 outpatients

median age 77 years

National Comparative Audit

89% (2195/2461) of inpatients had at least one additional risk factor for TACO, apart from age

NHS Blood and Transplant

3 most common risk factors

Hypoalbuminaemia	**52%**	(1283/2461)
Concomitant IV fluids	**39%**	(949/2461)
Positive fluid balance	**35%**	(286/808)

Only **11%** (21/189) of inpatients who had at least one additional risk factor documented by auditor had risk of TACO documented in notes

Only **61%** (1513/2461) of inpatients were weighed within a week prior to transfusion

10% (151/1513) of inpatients weighed, weighed less than 50kg

Only **23%** (490/2119) of outpatients were weighed within a week prior to transfusion

43% (915/2119) of outpatients were seen by the person 'prescribing' the blood in the week before transfusion

Assessing risk of TACO

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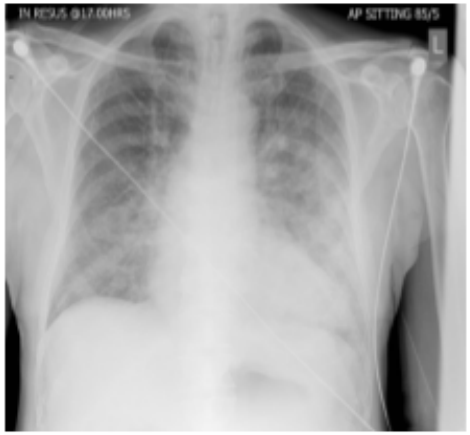
4.3% (107/2461) of inpatients developed acute or worsening respiratory distress

1.7% (35/2110) of outpatients were re-admitted within 24 hours of the transfusion

20% (7/35) were admitted with worsening respiratory symptoms

Diagnosis & treatment of TACO



33% (4/12) of inpatients diagnosed with TACO by the hospital were reported to SHOT

No outpatients were diagnosed with TACO by the hospital

Reporting of TACO to SHOT

NHS Blood and Transplant

1. Use formal pre-transfusion risk assessment
2. Include risk of TACO in consent – clearly document
3. Weigh all patients pre-transfusion(within 1 week)
4. Document weight clearly on prescription
5. The person authorising the blood must review patient within 1 week prior to transfusion (or 24 hours if inpatient)

Key Recommendations

NHS Blood and Transplant

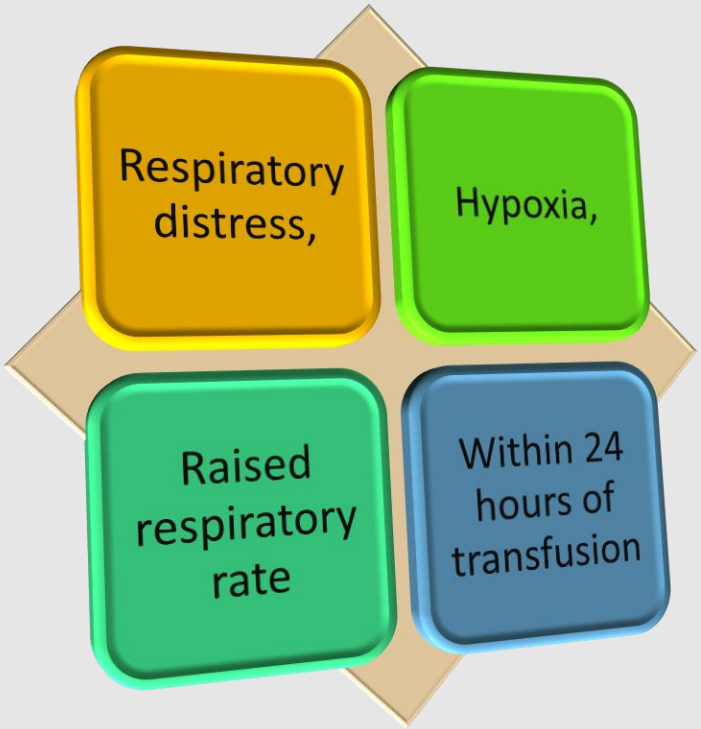
Recommendations: Pre-emptive measures

In non bleeding patients:	Use minimum number of RBC units to achieve target Hb i.e. single unit transfusion	Reassess after every unit for complications of transfusion	Recheck Hb after each transfused unit	Only prescribe in stable patients who have pre-transfusion Hb <70g/L (<80g/L in CVD) unless have personalised transfusion plan
In patients at risk of TACO:	Monitor fluid balance	Prescribe 1 unit at a time	Review patient following each unit	Prescribe according to body weight (e.g. 4 ml/kg)
	Transfuse at slower rate	Consider prophylactic diuretic	Monitor observations closely (SAO2)	

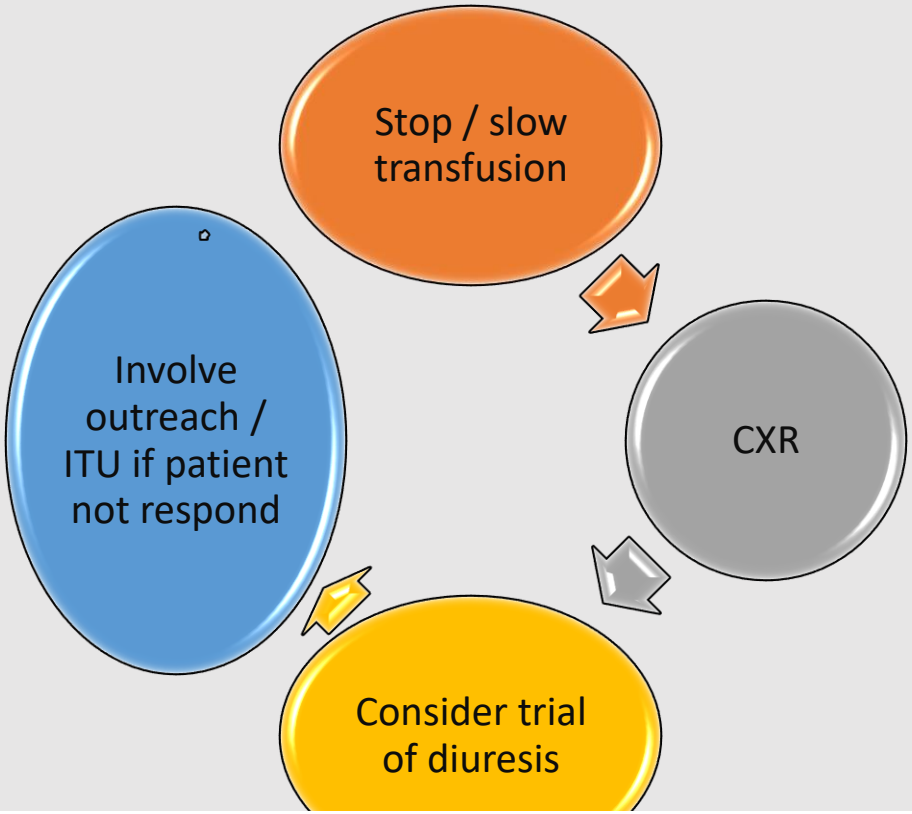
Training

NHS Blood and Transplant

Education



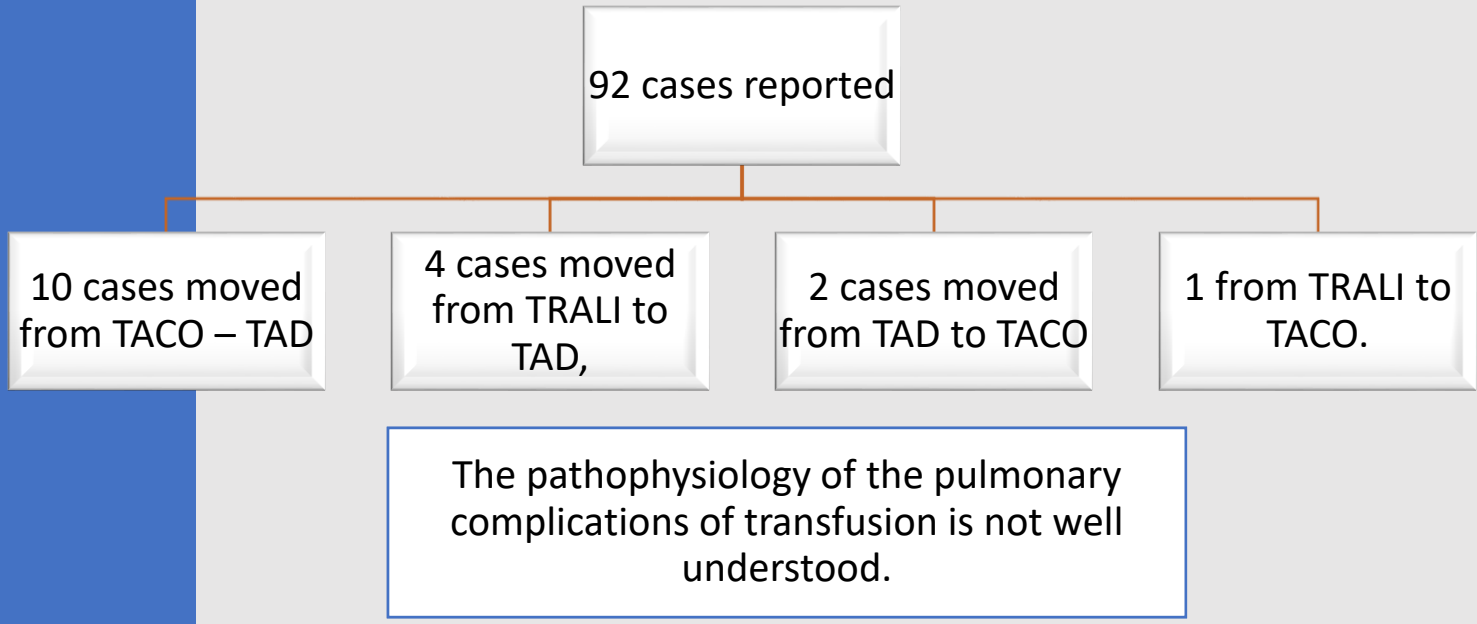
Management



Patients who have had an episode of TACO are at high risk of further events and patients should be highlighted as high risk prior to any future transfusions

NHS Blood and Transplant

SHOT 2017



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

Hypoalbuminemia	Liver dysfunction
Positive fluid balance prior to transfusion	Cardiac disease
Concomitant IV fluids	Peripheral oedema
Chronic kidney disease	Weight <50kg
Diuretic use	Respiratory symptoms of undiagnosed cause
	Pulmonary oedema

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Andrewski et al., Transfusion 2012; 52(11):2310-20; Clifford et al., Anesthesiology 2017; 126(3):409-18; Li et al., Transfusion 2011;51(2):338-43; Lieberman et al., Transfusion Med Rev 2013;27(4):206-12; Piccin et al., Transfusion 2015;55(6):1223-30

Risk Factors for TACO

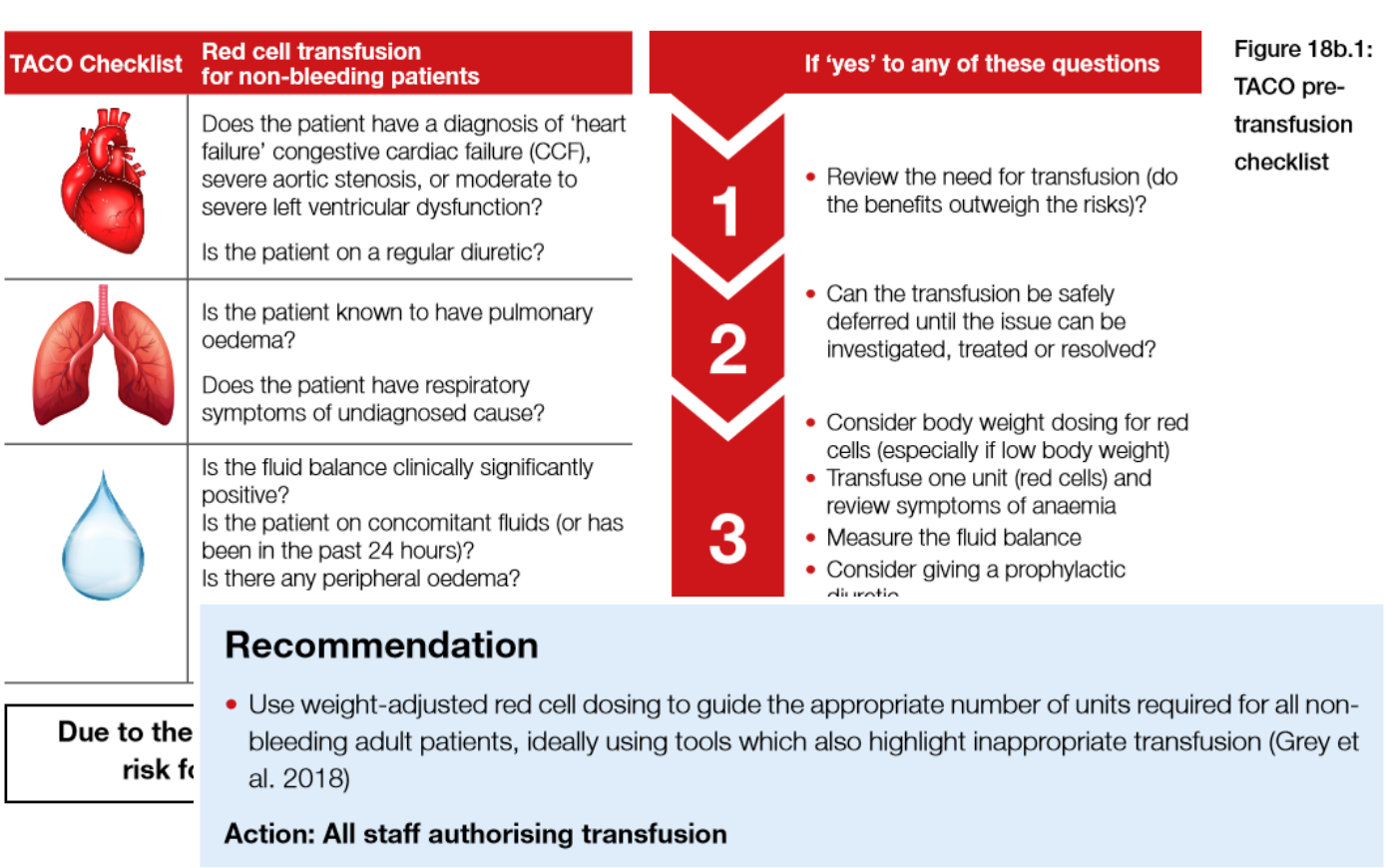

Figure 18b.1: TACO pre-transfusion checklist

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TACO Checklist

NHS
Blood and Transplant

Serious Hazards Of Transfusion SHOT 20 YEARS

All cases of TACO must be reported to SHOT

Include a reminder to report cases of SHOT to the hospital transfusion team in blood transfusion training, in TACO checklists and hospital transfusion procedures.

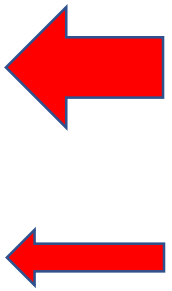
27.3% inpatients identified by the treating team as having TACO were reported to SHOT

NHS
Blood and Transplant

Transfusion Associated Circulatory Overload
2017 South East Coast RTC Audit

NHS Blood and Transplant

	Inpatients	Outpatients
National	2461	2119
Regional	224	191
Ashford and St Peters Hospitals NHS Foundation Trust	16	15
Conquest Hospital	19	19
Dartford and Gravesham NHS Trust	20	20
Eastbourne Hospital	17	16
Frimley Park Hospital	20	5
Kent & Canterbury Hospital	17	20
Maidstone and Tunbridge Wells NHS Trust	11	8
Medway NHS Foundation Trust	14	12
Queen Elizabeth The Queen Mother Hospital	19	14
Royal Surrey County Hospital NHS Foundation Trust	19	16
Royal Sussex County Hospital	5	0
St. Richard's Hospital	20	10
Surrey and Sussex Healthcare NHS Trust	8	12
William Harvey Hospital	15	14
Worthing Hospital	4	10



Demographics

157/171 (92%) sites contributed to national data

Indication for transfusion: documented in the notes

NHS Blood and Transplant

	Inpatients	Outpatients
National	1799 (74%)	1502 (71%)
Regional	155/224 (69%)	135/191 (71%)
Ashford and St Peters Hospitals NHS Foundation Trust	10/16 (71%)	13/15 (87%)
Conquest Hospital	13/19 (68%)	14/19 (74%)
Dartford and Gravesham NHS Trust	14/20 (70%)	18/20 (90%)
Eastbourne Hospital	16/17 (94%)	16/16 (100%)
Frimley Park Hospital	14/20 (70%)	4/5 (80%)
Kent & Canterbury Hospital	13/17 (76%)	15/20 (75%)
Maidstone and Tunbridge Wells NHS Trust	5/11 (45%)	2/8 (25%)
Medway NHS Foundation Trust	8/14 (57%)	8/12 (67%)
Queen Elizabeth The Queen Mother Hospital	14/19 (74%)	10/14 (71%)
Royal Surrey County Hospital NHS Foundation Trust	10/19 (53%)	5/16 (31%)
Royal Sussex County Hospital	4/5 (80%)	0/0 (0%)
St. Richard's Hospital	15/20 (75%)	1/10 (10%)
Surrey and Sussex Healthcare NHS Trust	7/8 (88%)	12/12 (100%)
William Harvey Hospital	11/15 (73%)	13/14 (93%)
Worthing Hospital	1/4 (25%)	4/10 (40%)

Benefits & risks of transfusion – Inpatients only

NHS Blood and Transplant

	Inpatients
National	502 (20.5%)
Regional	21/224 (9%)
Ashford and St Peters Hospitals NHS Foundation Trust	1/16 (6%)
Conquest Hospital	0/19 (0%)
Dartford and Gravesham NHS Trust	0/20 (0%)
Eastbourne Hospital	12/17 (71%)
Frimley Park Hospital	1/20 (5%)
Kent & Canterbury Hospital	0/17 (0%)
Maidstone and Tunbridge Wells NHS Trust	0/11 (0%)
Medway NHS Foundation Trust	0/14 (0%)
Queen Elizabeth The Queen Mother Hospital	0/19 (0%)
Royal Surrey County Hospital NHS Foundation Trust	0/19 (0%)
Royal Sussex County Hospital	0/5 (0%)
St. Richard's Hospital	1/20 (5%)
Surrey and Sussex Healthcare NHS Trust	6/8 (75%)
William Harvey Hospital	0/15 (0%)
Worthing Hospital	0/4 (0%)

Documentation of patients at risk of TACO – Inpatients only

NHS Blood and Transplant

	Inpatients
National	21/189 (11%)
Regional	0/21 (0)%
Ashford and St Peters Hospitals NHS Foundation Trust	0/1 (0)%
Conquest Hospital	0/4 (0)%
Dartford and Gravesham NHS Trust	-
Eastbourne Hospital	0/2 (0)%
Frimley Park Hospital	0/6 (0)%
Kent & Canterbury Hospital	-
Maidstone and Tunbridge Wells NHS Trust	0/3 (0)%
Medway NHS Foundation Trust	-
Queen Elizabeth The Queen Mother Hospital	-
Royal Surrey County Hospital NHS Foundation Trust	0/2 (0)%
Royal Sussex County Hospital	-
St. Richard's Hospital	-
Surrey and Sussex Healthcare NHS Trust	0/1 (0)%
William Harvey Hospital	0/1 (0)%
Worthing Hospital	0/1 (0)%

Inpatients weighed in the week prior to transfusion

NHS Blood and Transplant

	Inpatients
National	1513 (61%)
Regional	92/224 (41%)
Ashford and St Peters Hospitals NHS Foundation Trust	13/16 (81%)
Conquest Hospital	8/19 (42%)
Dartford and Gravesham NHS Trust	3/20 (15%)
Eastbourne Hospital	16/17 (94%)
Frimley Park Hospital	11/20 (55%)
Kent & Canterbury Hospital	1/17 (6%)
Maidstone and Tunbridge Wells NHS Trust	2/11 (18%)
Medway NHS Foundation Trust	6/14 (43%)
Queen Elizabeth The Queen Mother Hospital	3/19 (16%)
Royal Surrey County Hospital NHS Foundation Trust	9/19 (47%)
Royal Sussex County Hospital	5/5 (100%)
St. Richard's Hospital	13/20 (65%)
Surrey and Sussex Healthcare NHS Trust	0/8 (0%)
William Harvey Hospital	0/15 (0%)
Worthing Hospital	2/4 (50%)

Outpatients seen in the 7 days preceding transfusion

NHS Blood and Transplant

National	951 (43%)
Regional	74/191 (39%)
Ashford and St Peters Hospitals NHS Foundation Trust	14/15 (93%)
Conquest Hospital	7/19 (37%)
Dartford and Gravesham NHS Trust	8/20 (40%)
Eastbourne Hospital	16/16 (100%)
Frimley Park Hospital	2/5 (40%)
Kent & Canterbury Hospital	0/20 (0%)
Maidstone and Tunbridge Wells NHS Trust	2/8 (25%)
Medway NHS Foundation Trust	2/12 (17%)
Queen Elizabeth The Queen Mother Hospital	3/14 (21%)
Royal Surrey County Hospital NHS Foundation Trust	5/16 (31%)
Royal Sussex County Hospital	-
St. Richard's Hospital	1/10 (10%)
Surrey and Sussex Healthcare NHS Trust	6/12 (50%)
William Harvey Hospital	5/14 (36%)
Worthing Hospital	3/10 (30%)

Pre-emptive measures

	Inpatients
National	769/1349 (57%)
Regional	70/117 (60%)
Ashford and St Peters Hospitals NHS Foundation Trust	8/9 (89%)
Conquest Hospital	3/15 (20%)
Dartford and Gravesham NHS Trust	6/9 (67%)
Eastbourne Hospital	1/3 (33%)
Frimley Park Hospital	3/7 (43%)
Kent & Canterbury Hospital	1/7 (14%)
Maidstone and Tunbridge Wells NHS Trust	5/5 (100%)
Medway NHS Foundation Trust	6/7 (86%)
Queen Elizabeth The Queen Mother Hospital	5/9 (56%)
Royal Surrey County Hospital NHS Foundation Trust	11/15 (73%)
Royal Sussex County Hospital	3/4 (75%)
St. Richard's Hospital	6/12 (50%)
Surrey and Sussex Healthcare NHS Trust	6/6 (100%)
William Harvey Hospital	5/8 (63%)
Worthing Hospital	0/4 (0%)

NHS Blood and Transplant

Inpatients with at least 1 additional risk factor who had a completed fluid balance recorded in 24 hours prior to transfusion

NHS Blood and Transplant

	Inpatients
National	236/2175 (11%)
Regional	14/192 (7%)
Ashford and St Peters Hospitals NHS Foundation Trust	1/11 (9%)
Conquest Hospital	2/18 (11%)
Dartford and Gravesham NHS Trust	2/18 (11%)
Eastbourne Hospital	0/14 (0%)
Frimley Park Hospital	2/18 (11%)
Kent & Canterbury Hospital	1/14 (7%)
Maidstone and Tunbridge Wells NHS Trust	0/8 (0%)
Medway NHS Foundation Trust	0/12 (0%)
Queen Elizabeth The Queen Mother Hospital	1/15 (7%)
Royal Surrey County Hospital NHS Foundation Trust	2/17 (12%)
Royal Sussex County Hospital	1/4 (25%)
St. Richard's Hospital	2/19 (11%)
Surrey and Sussex Healthcare NHS Trust	0/8 (0%)
William Harvey Hospital	0/14 (0%)
Worthing Hospital	0/2 (0%)

Inpatients with at least 1 additional risk factor who had pre-emptive diuretics prescribed

NHS
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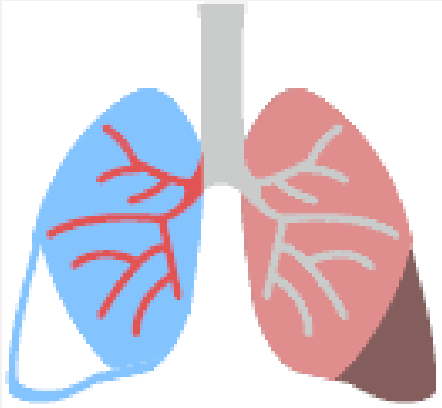
Diagnosis and treatment of TACO

Suspect TACO when there is respiratory distress with features of fluid overload

NHS Blood and Transplant



64% inpatients who developed acute or worsening respiratory distress had a CXR

100% outpatients admitted with worsening respiratory symptoms had a CXR

There is no regional site data for this standard because only 69 patients from across the country developed these symptoms, so inter-site comparison is meaningless

NHS
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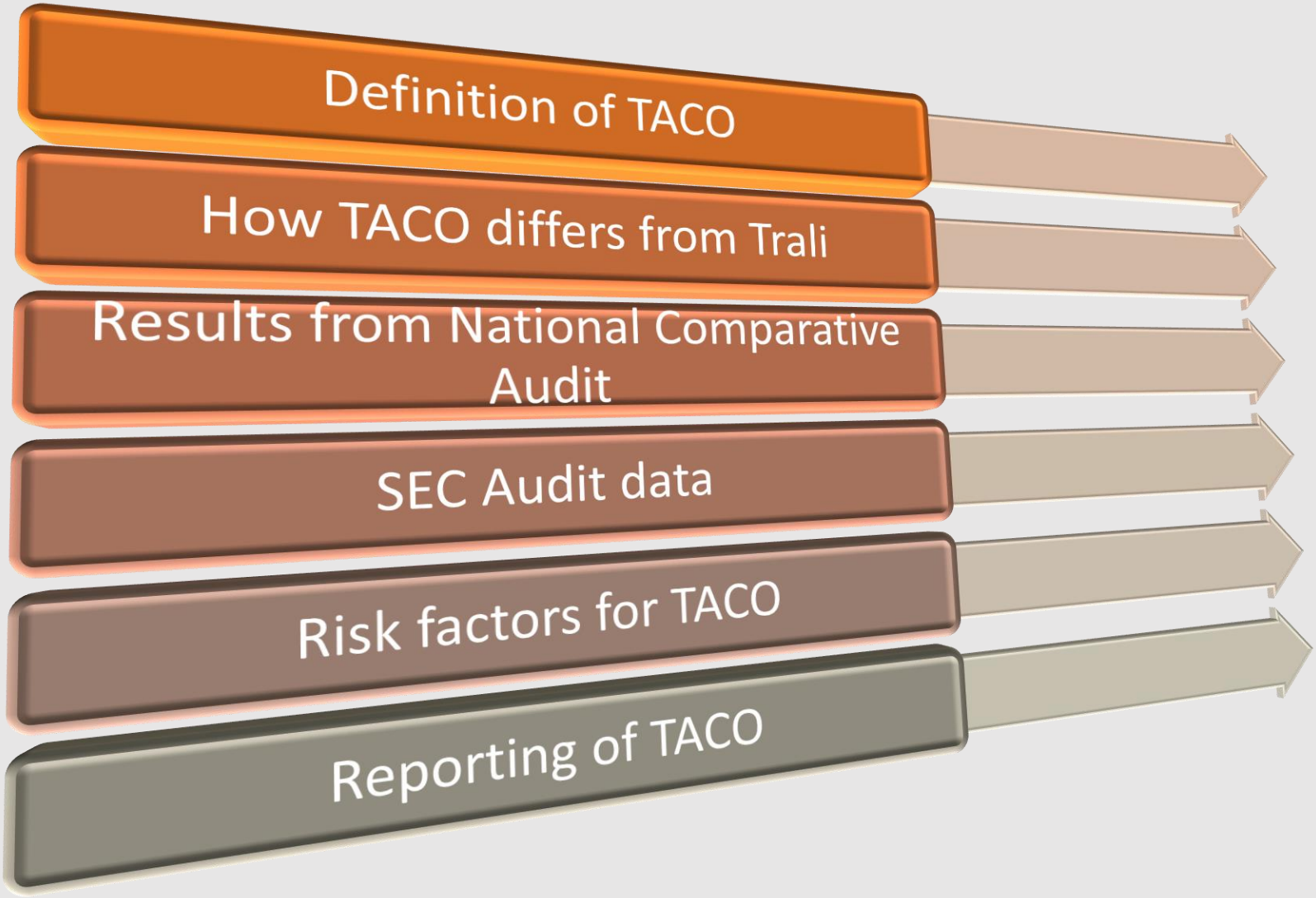
51% inpatients who developed acute or worsening respiratory distress and **50% outpatients** admitted with acute or worsening respiratory distress with worsening chest x-ray changes **had a trial of diuresis**

Treat patients developing features of TACO with a trial of diuretics, morphine or nitrates

There is no regional site data for this standard because only 21 patients from across the country developed these symptoms, so inter-site comparison is meaningless

Summary


Definition of TACO
How TACO differs from Trali
Results from National Comparative Audit
SEC Audit data
Risk factors for TACO
Reporting of TACO

NHS
Blood and Transplant

Thank you for listening