SHOT shockers- learning from experience

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SHOT Serious Hazards of Transfusion

Provides assurance regarding transfusion safety in UK


Patient safety
in Transfusion

It is important to recognise…

PATIENT BLOOD MANAGEMENT

HAEMOVIGILANCE

A Reporting Culture

A Just Culture

A Flexible Culture

A Learning Culture

A Questioning Culture

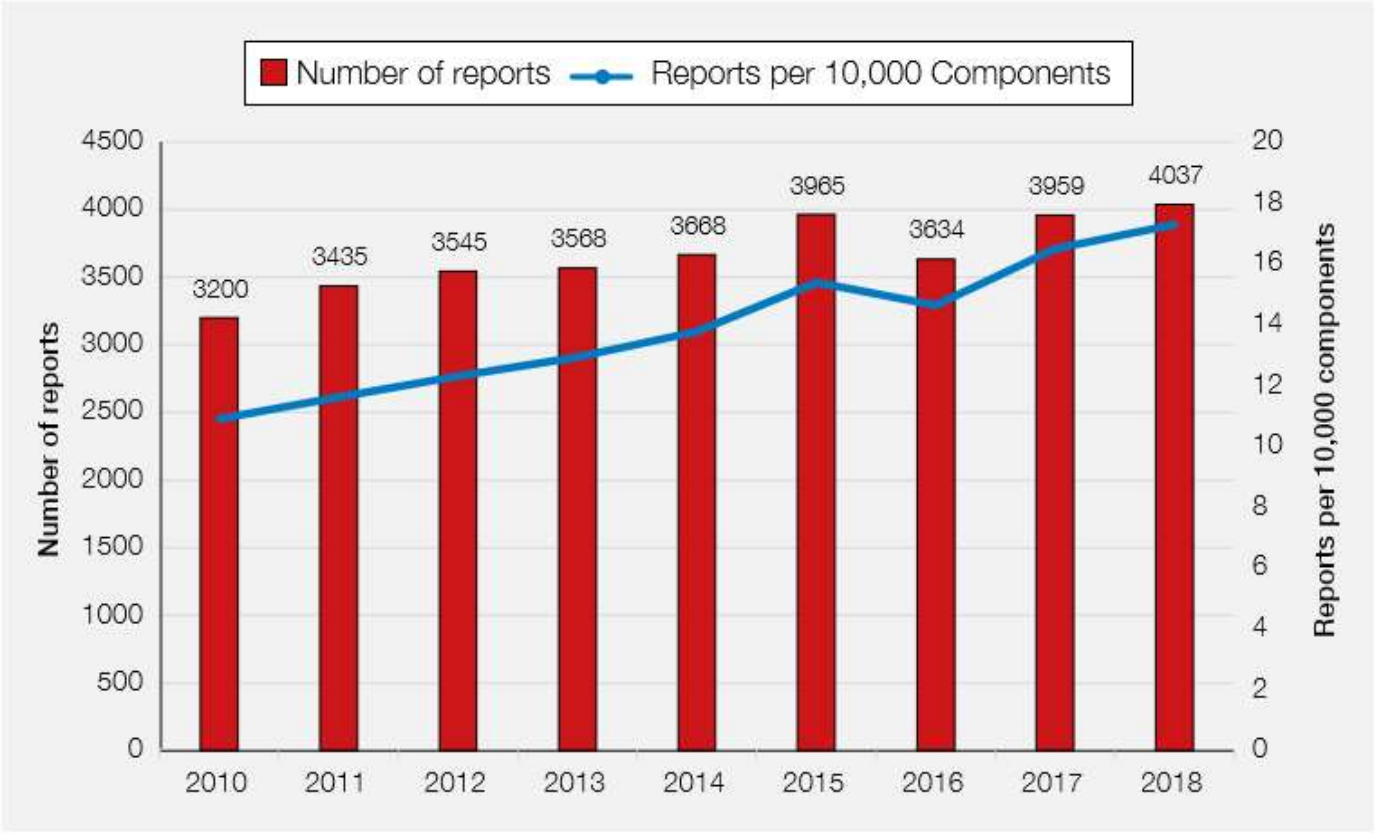
Safety culture in practice- key aspects

An event is not always a disaster

Not reporting one could be

And not learning from one is equally bad

Number of reports submitted to SHOT, and per 10,000 components issued 2010-2018



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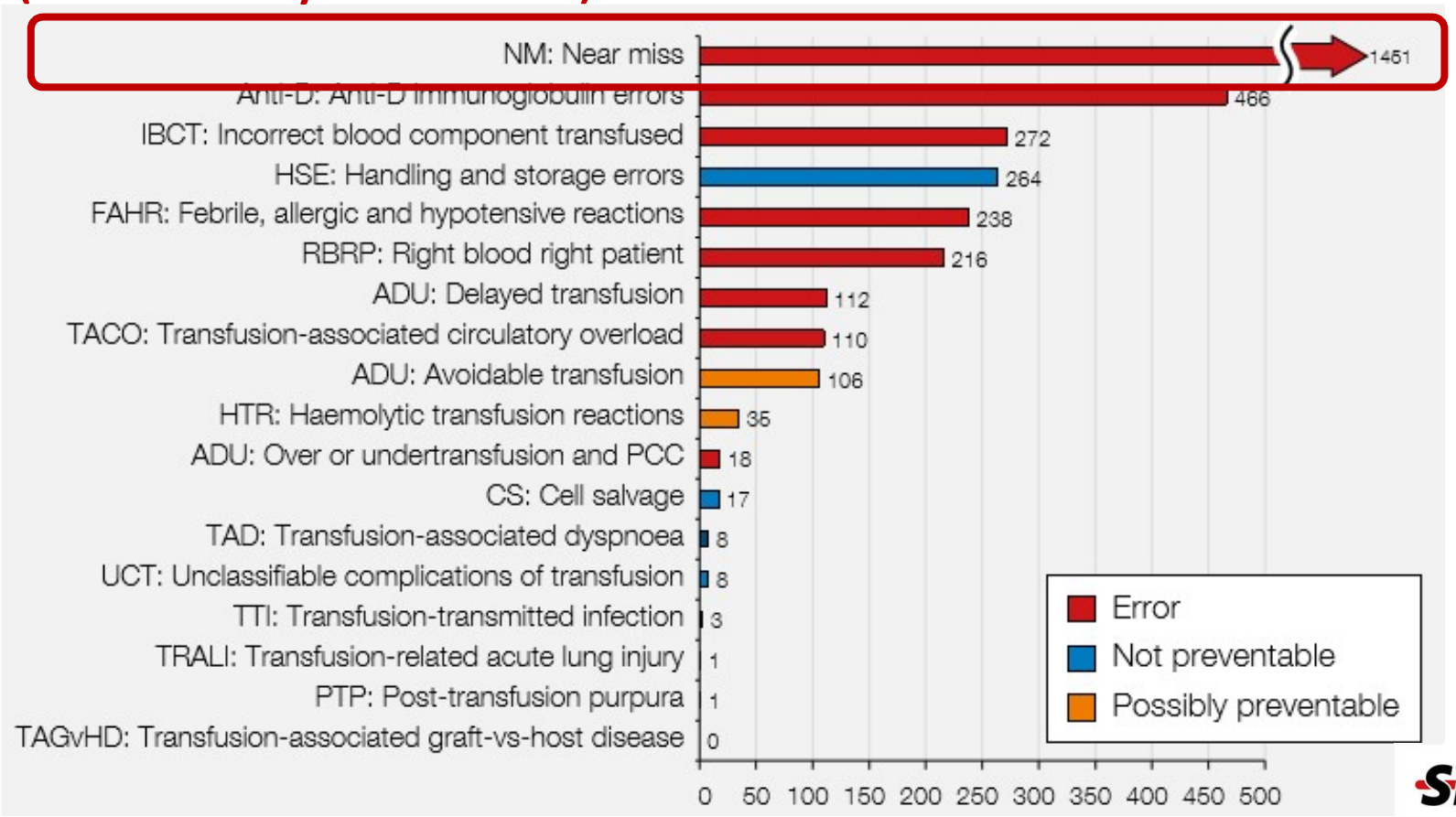
Summary data for 2018 all categories n=3326 (ranked by number)



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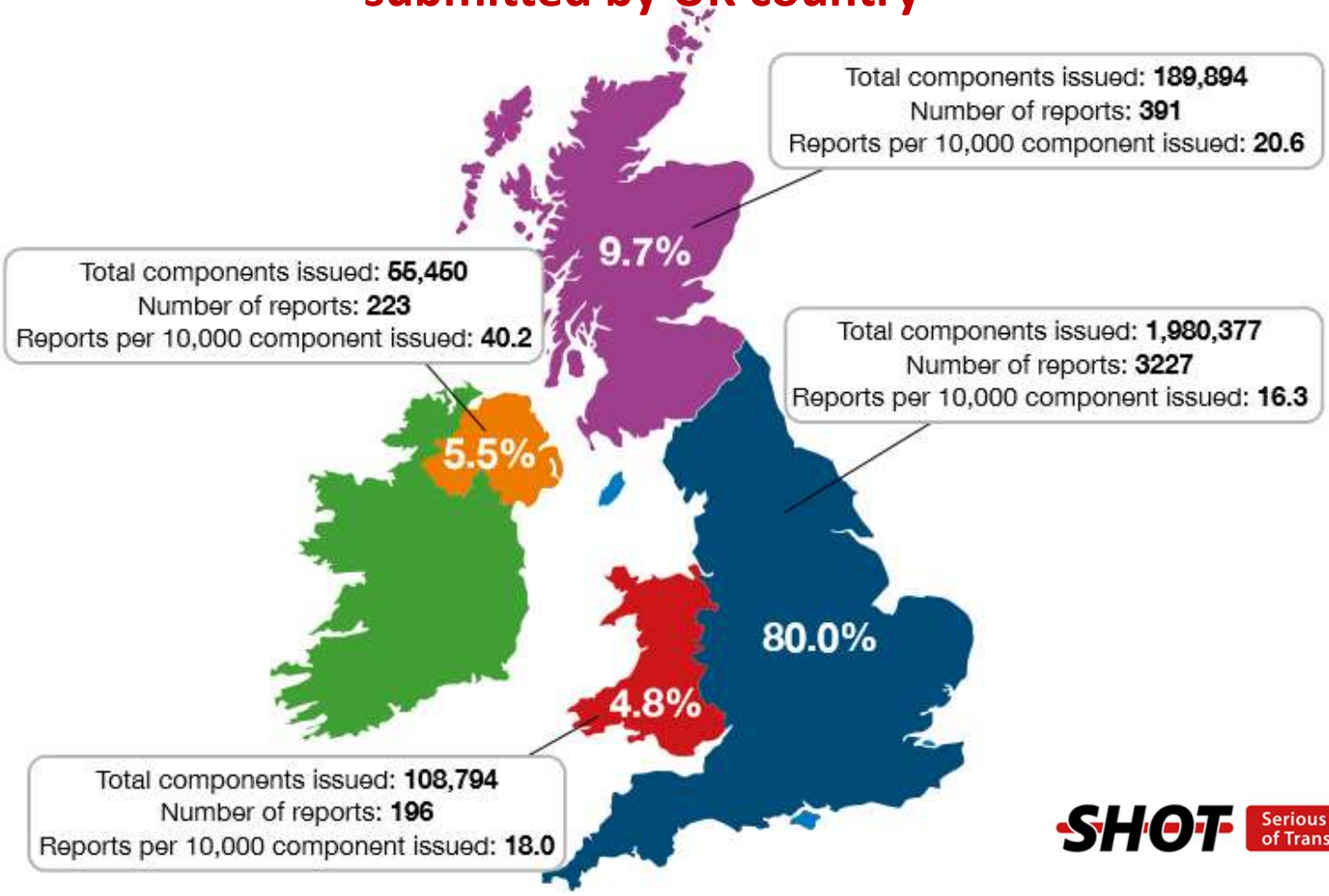
Blood components issued in UK and percentage of SHOT reports submitted by UK country



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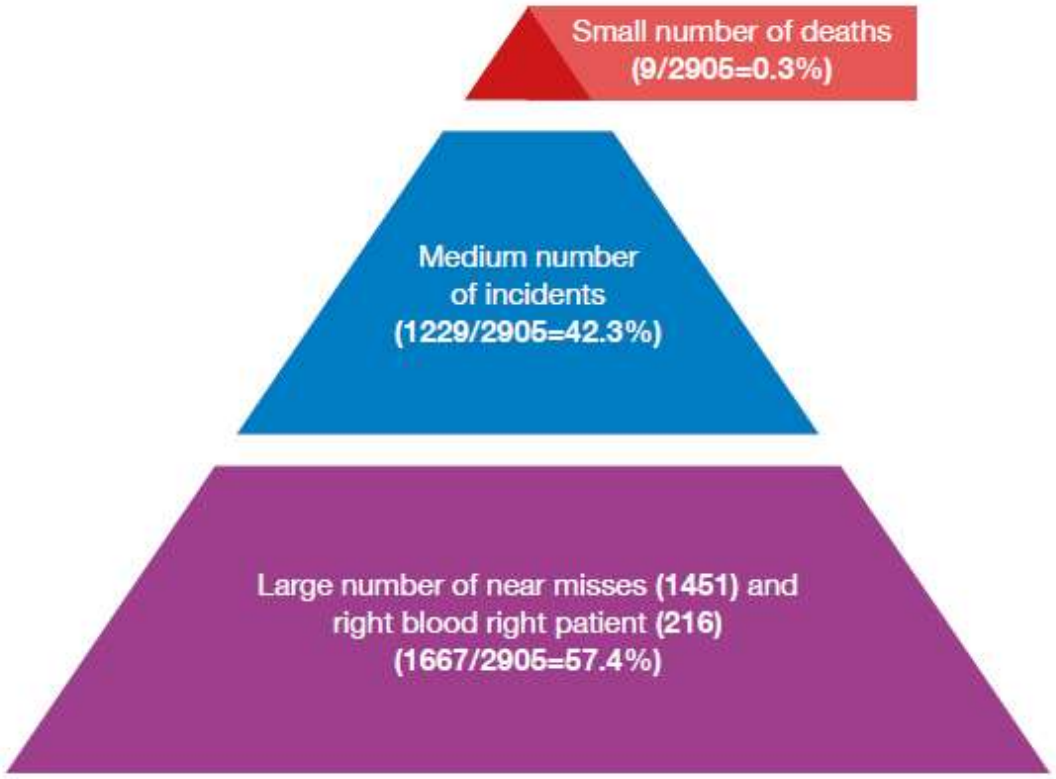
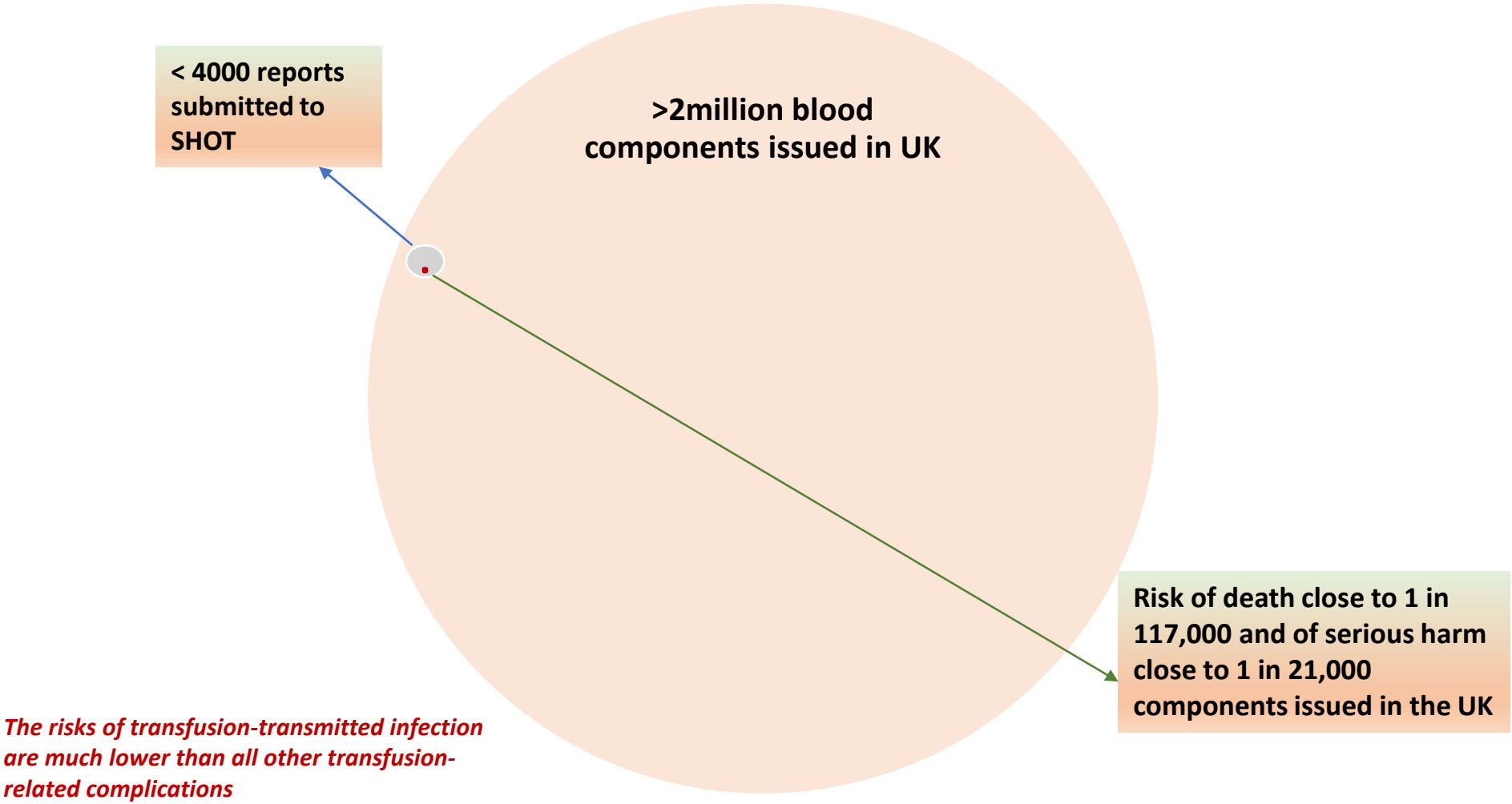
Reported errors triangle

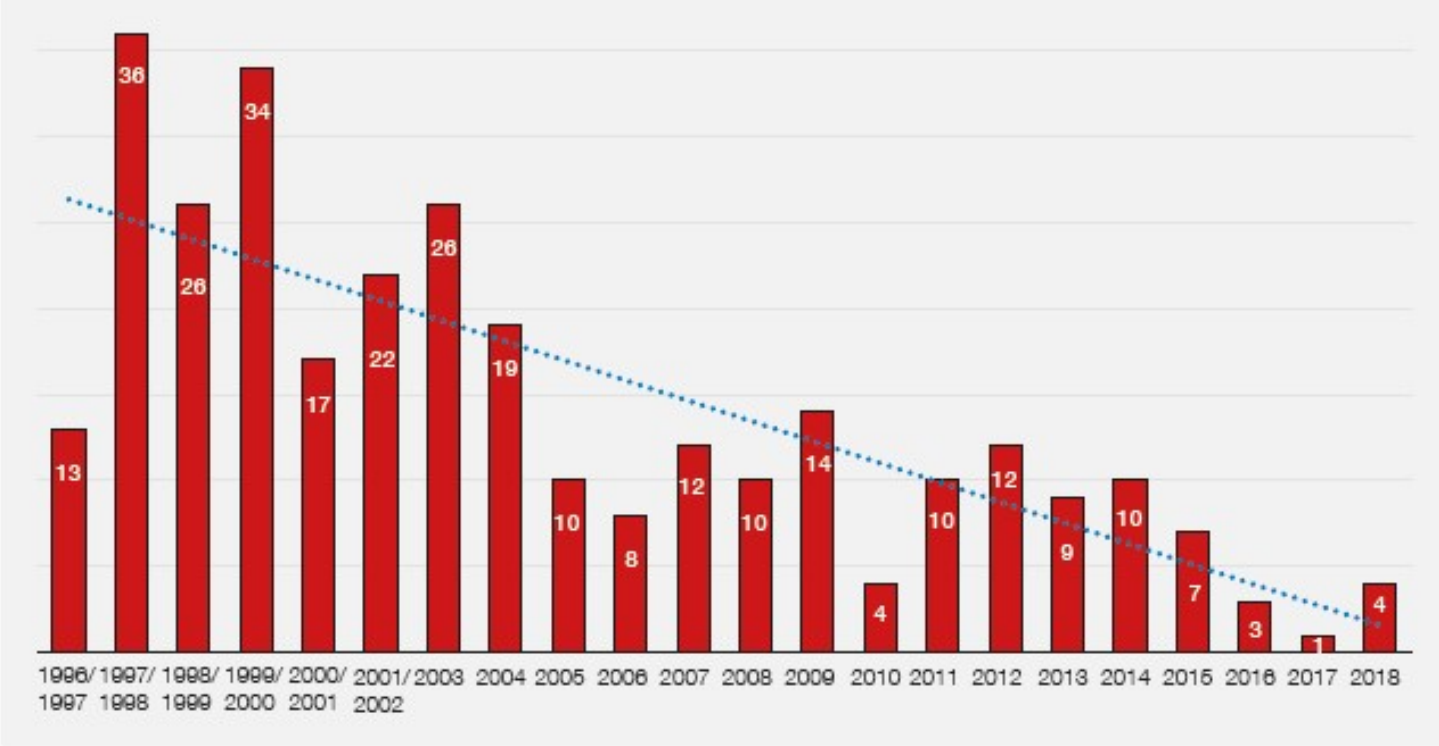


	Death definitely related	Death probably related	Death possibly related	Major morbidity
Delayed transfusion		2	6	
Overtransfusion			1	
FAHR				60
HTR		2		4
IBCT-WCT (clinical)				1
IBCT-WCT (laboratory)				2
IBCT-SRNM (laboratory)				1
UCT				3
TACO		2	3	36
TAD			2	1
TRALI		1		
TTI		1		1
Total	**0**	**8**	**12**	**109**

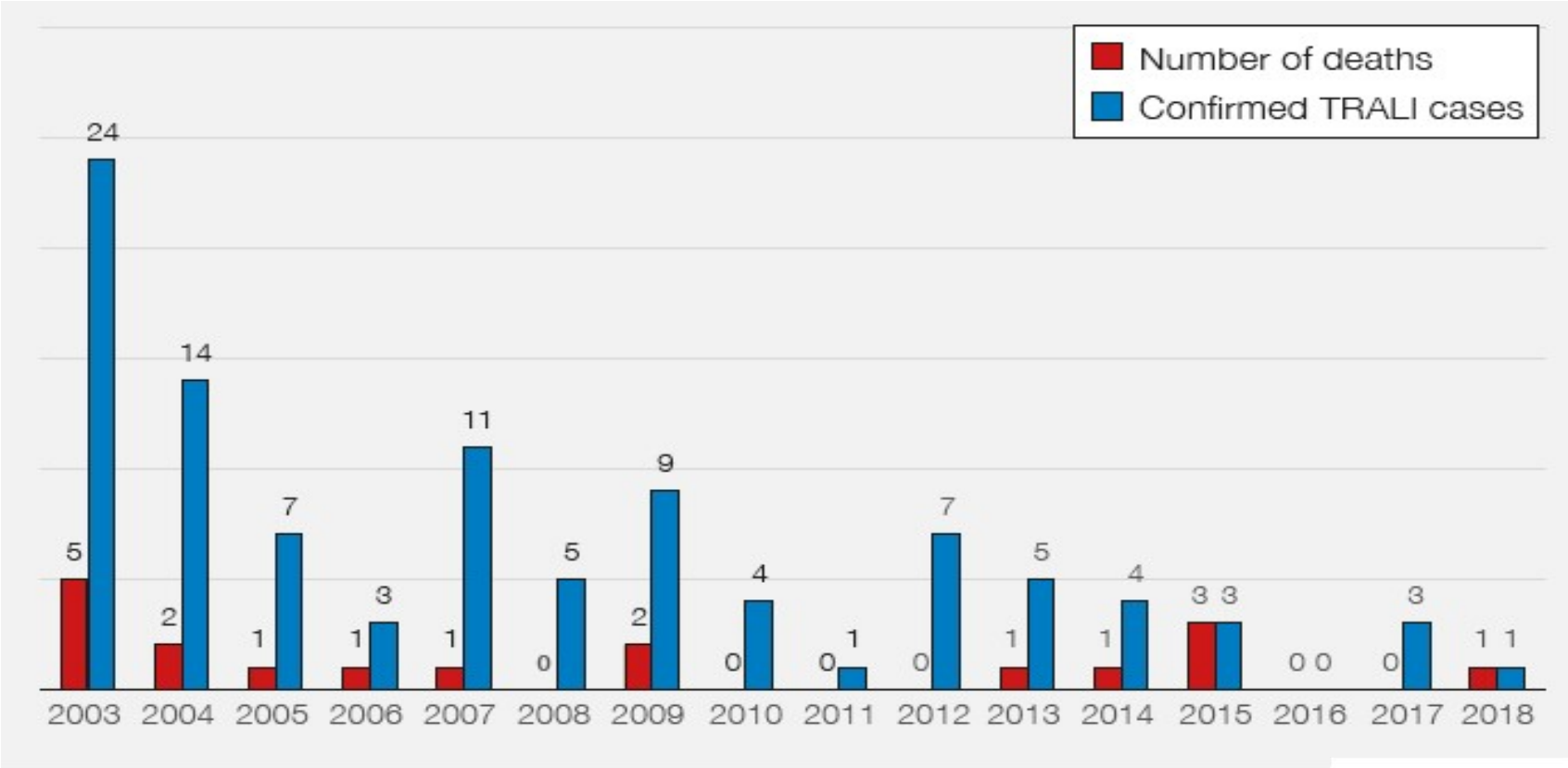


The risks of transfusion-transmitted infection are much lower than all other transfusion-related complications

Number of ABO-incompatible red cell transfusions 1996-2018



Number of confirmed TRALI cases and deaths at least possibly related to TRALI by year of report



TRALI=transfusion-related acute lung injury

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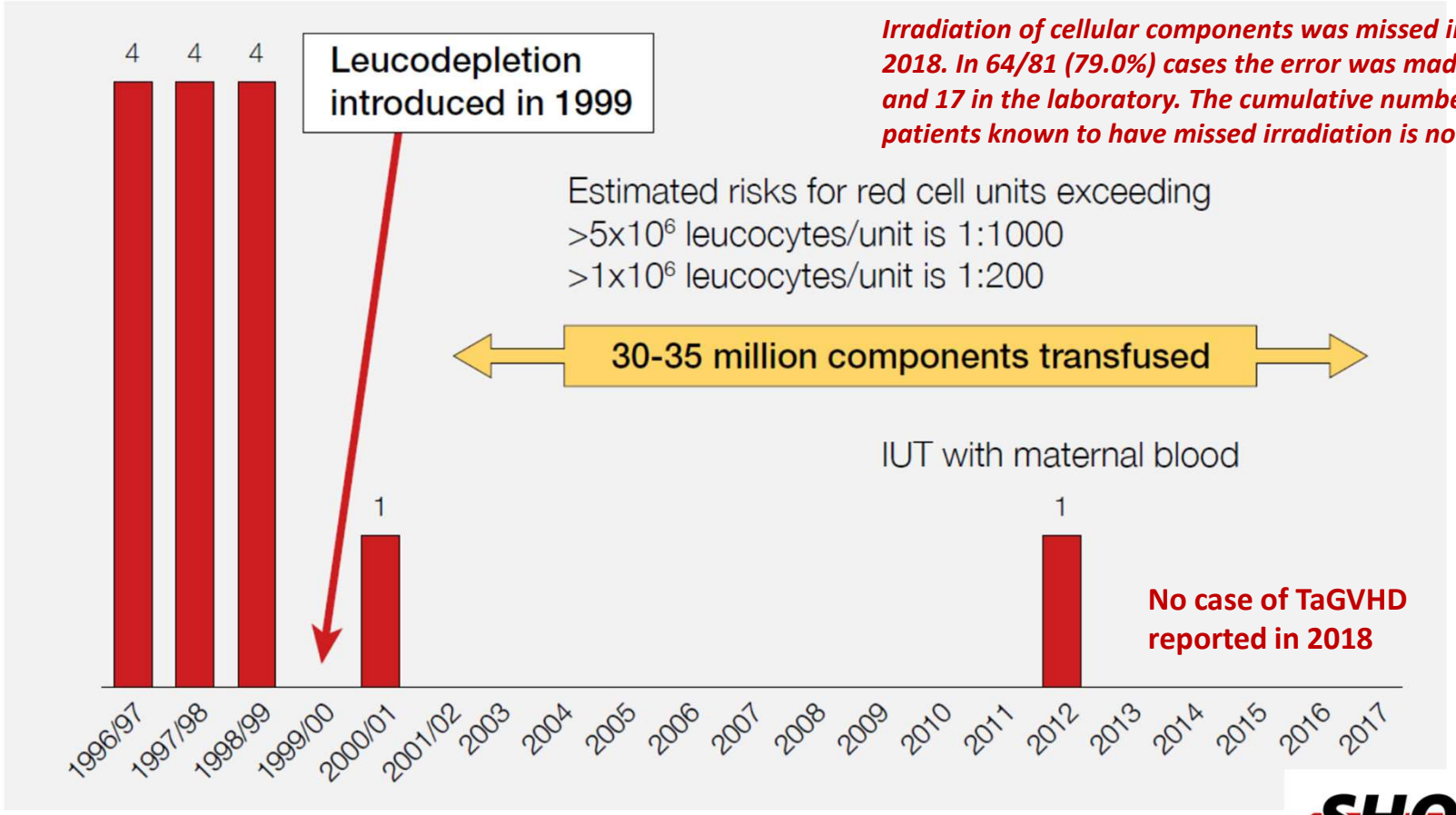
Transfusion-associated graft-v-host disease



Irradiation of cellular components was missed in 81 patients in 2018. In 64/81 (79.0%) cases the error was made in clinical areas and 17 in the laboratory. The cumulative number of reports of patients known to have missed irradiation is now 1478 since 1999.

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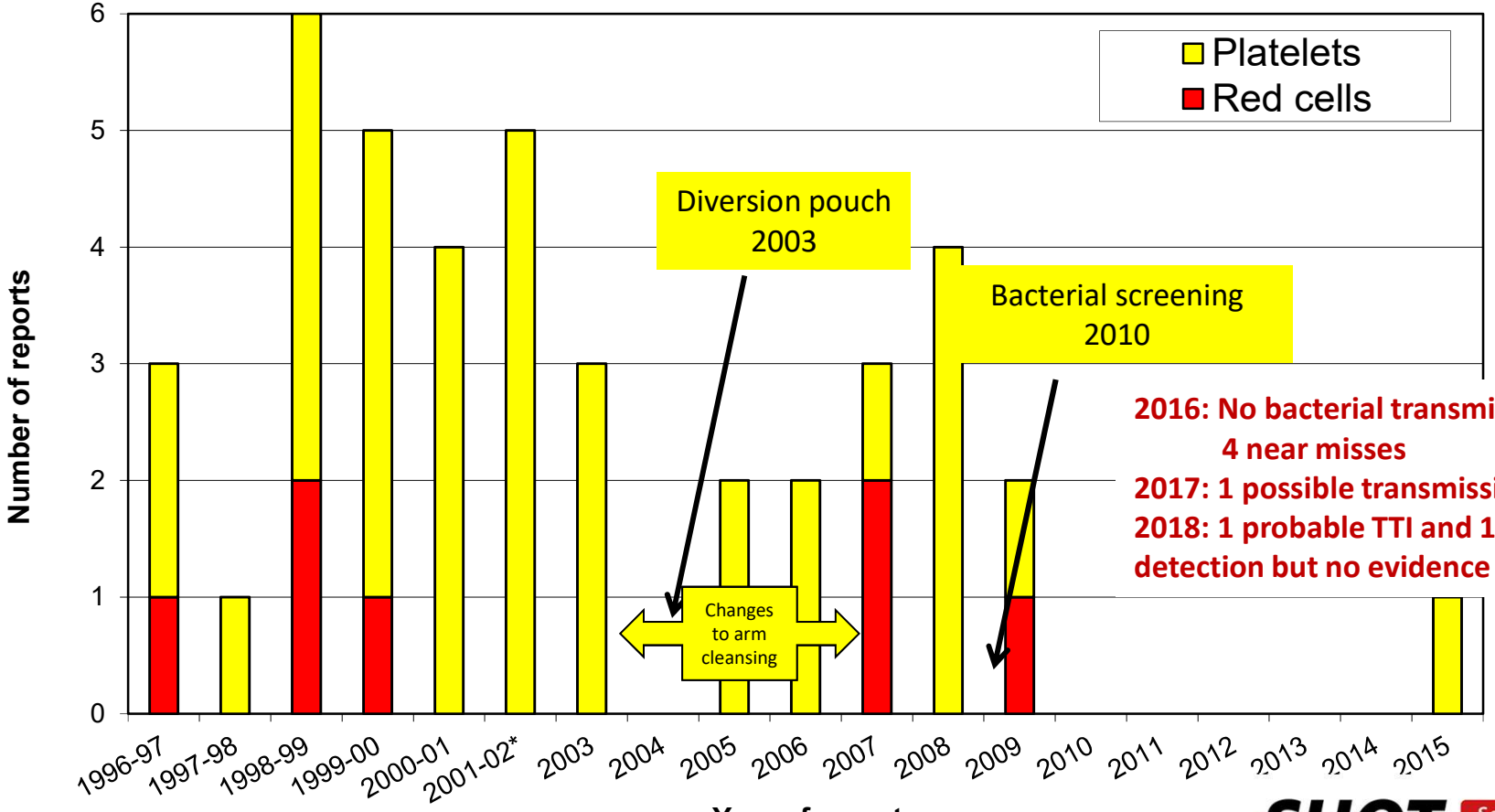
IUT=intrauterine transfusion.

Bacterial transmissions 1996-2018



2016: No bacterial transmissions
4 near misses
2017: 1 possible transmission
2018: 1 probable TTI and 1 late detection but no evidence of TTI

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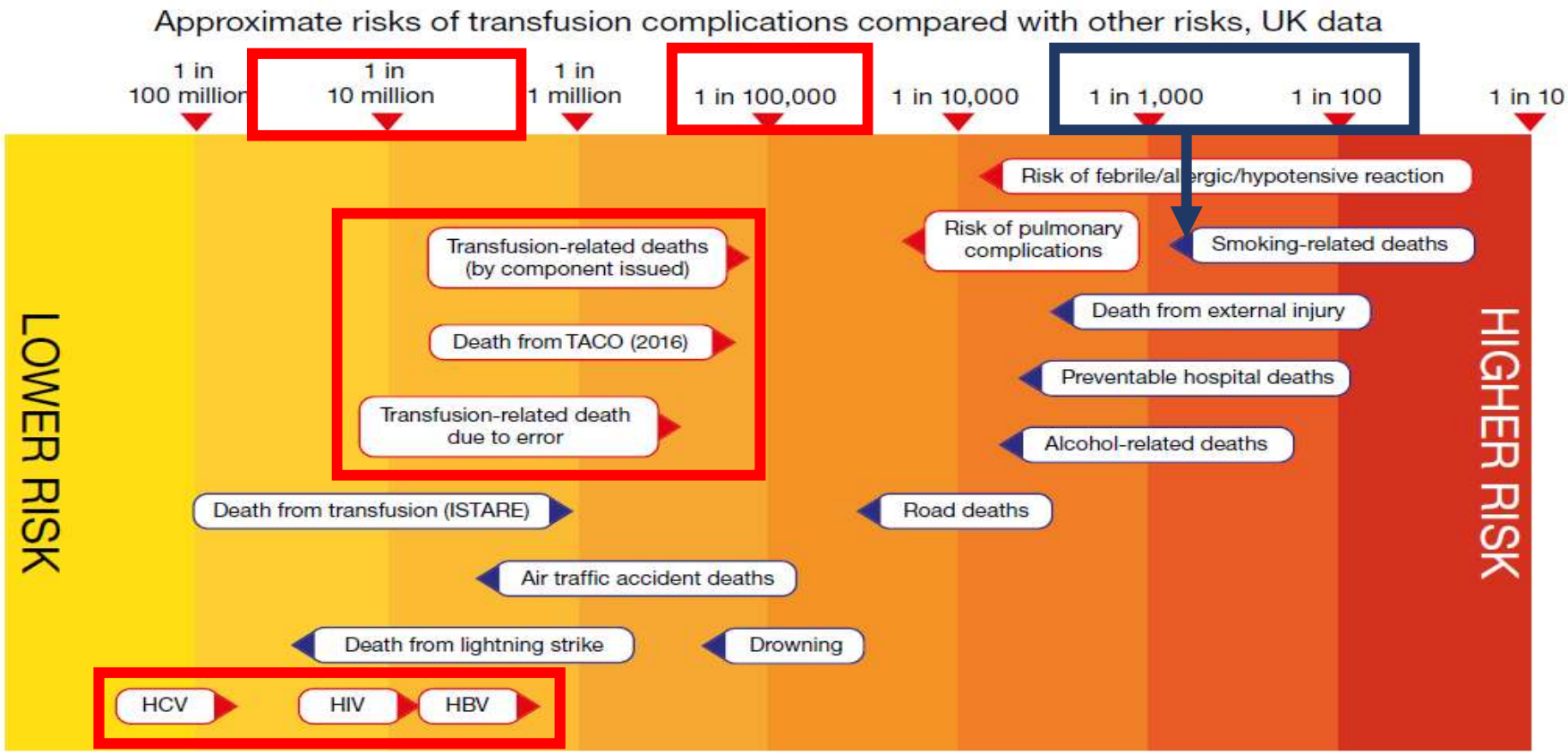
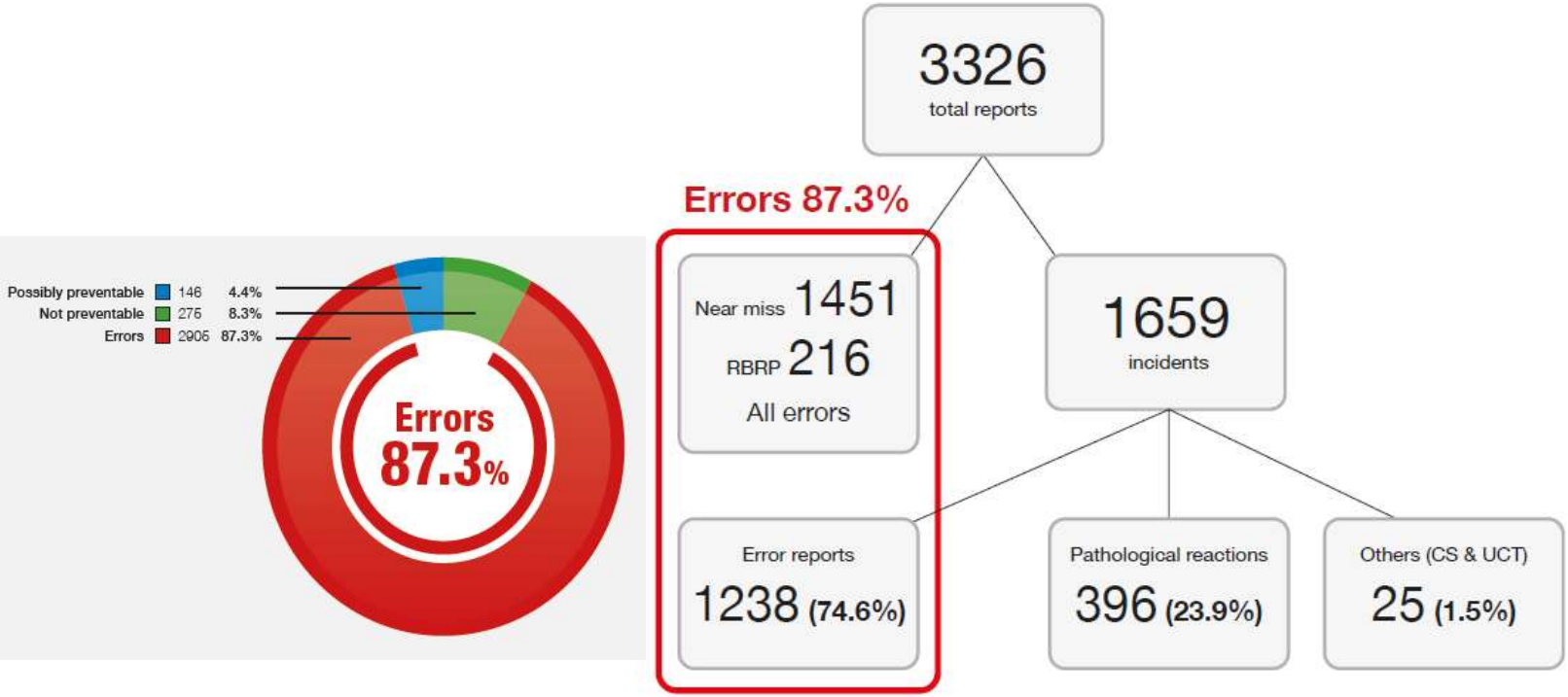
TIME TO IMPROVE


Errors and deviations
Simpler processes
Adequate resources
Building safer systems and improving patient safety in transfusion
Applying human factors principles
Learning from experiences
Investigating incidents



Sources of data: Many of these are found online in the UK office for national statistics. Red outline indicates SHOT data, blue outline indicates data from other sources. ISTARE is the International Haemovigilance Network database for the surveillance of adverse reactions and events in donor and recipients. Viral transmissions denote risk of infection, not deaths. HCV=hepatitis C virus; HIV=human immunodeficiency virus; HBV=hepatitis B virus. A full list of sources is available in supplementary information on the SHOT website www.shotuk.org.

Categorisation of reports analysed in 2018



RBRP=right blood right patient; CS=cell salvage; UCT=unclassifiable complications of transfusion

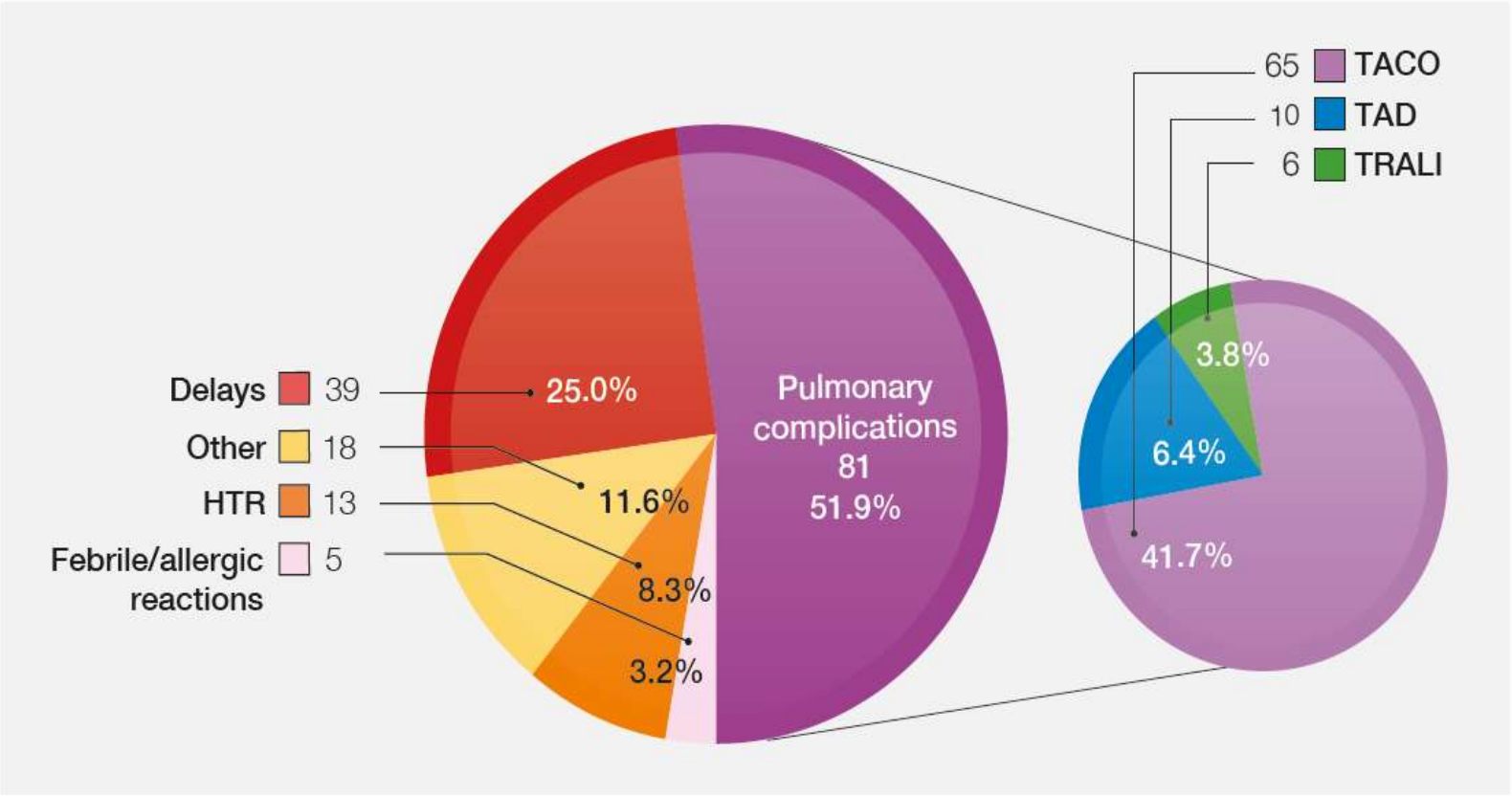
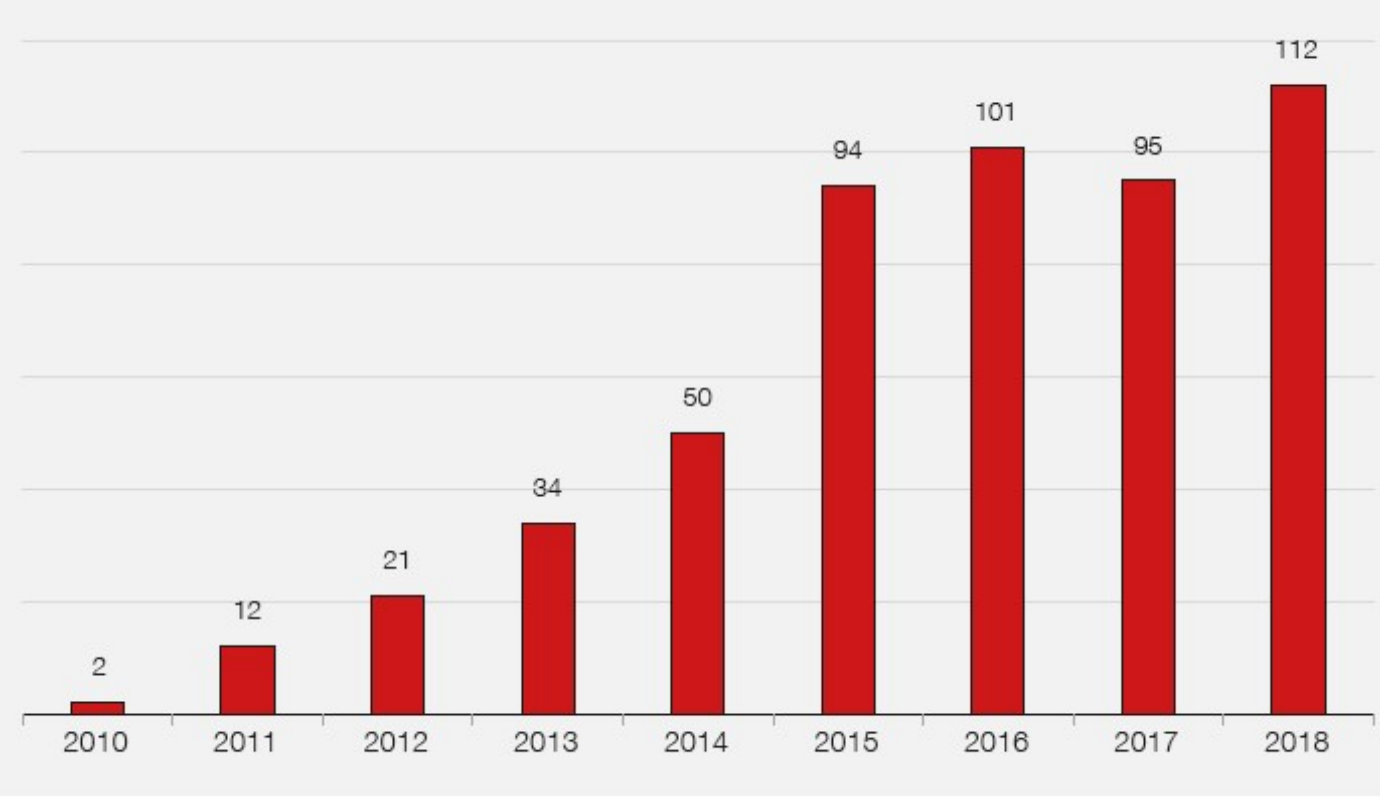


Figure 3.3: Transfusion-related deaths 2010 to 2018 n=156

Delayed transfusion reports by year 2010-2018

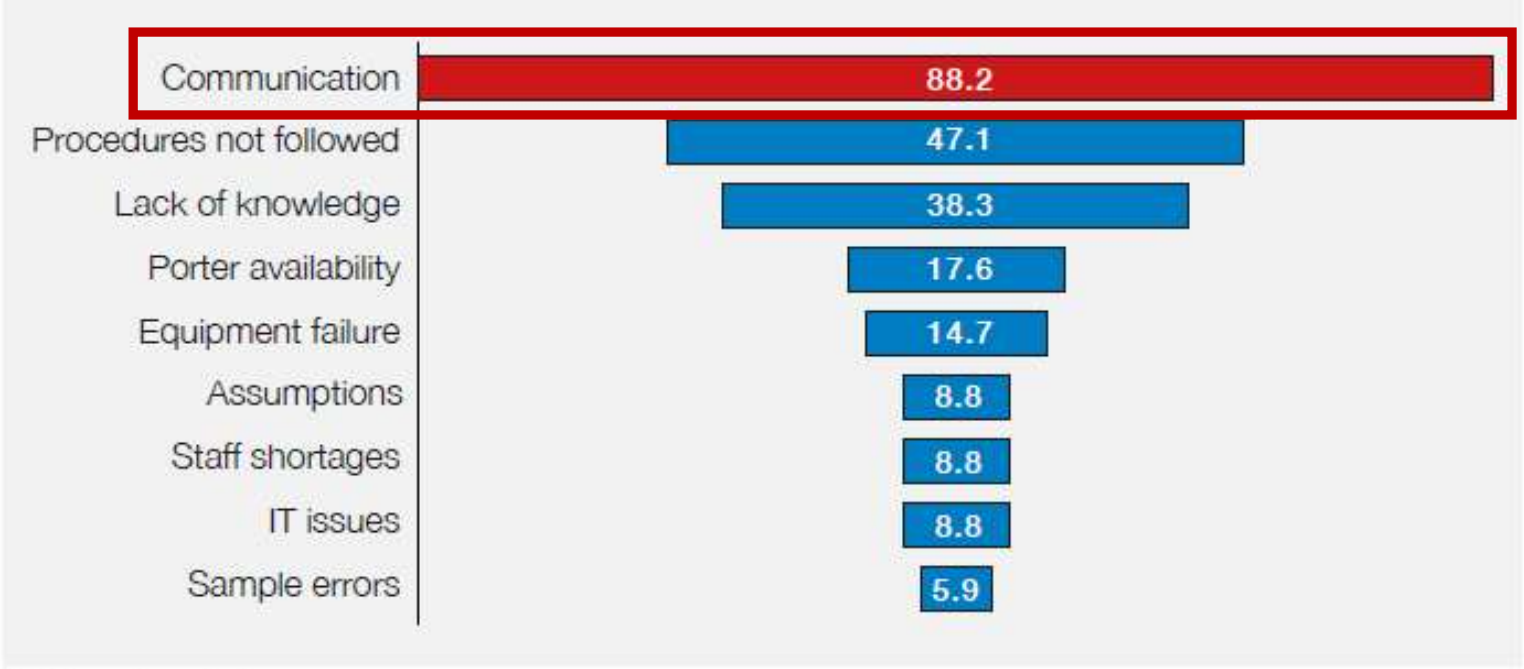


In 13 cases delays were experienced during MHP activation and in a further 6 cases with major haemorrhage but without MHP activation.

Delays can contribute to patient death. Every second counts!

Poor communication is the most common factor contributing to errors in MHP-related reports

(results as %)



IT=information technology

Multiple causes for delay with death from hypovolaemic shock due to gastrointestinal (GI) bleeding (1)

- *A woman in her 80s was seen at home for a chest infection (Day 1) and refused to come to hospital*
- *The following day (Day 2) she was seen again by the general practitioner (GP) and again declined admission although she was noted to be very pale and hypotensive (94/54mmHg, pulse rate 96 beats per minute (bpm))*
- *On Day 3 the ambulance crew were called to her home where she was found collapsed, very short of breath and cyanosed*
- *The working diagnosis was an acute exacerbation of chronic obstructive pulmonary disease (COPD)*
- *She was admitted at 11:05 and waited in a chair for 3 hours*

(continued)

Multiple causes for delay with death from hypovolaemic shock due to GI bleeding (2)

- *Blood results available at 17:20, 6 hours after admission, showed Hb 65g/L*
- *She was then noted to have melaena at 19:00 so a diagnosis of GI bleeding was made, and red cell transfusion authorised*
- *At 8 hours after admission (19:00), a blood sample was taken for crossmatch (which arrived in the laboratory 1.5 hours later)*
- *Blood was issued within an hour, however the transfusion was delayed and did not take place at all*
- *At 01:46 she had a cardiac arrest and died*
- *The cause of death was recorded as cardiac arrest due to hypovolaemic shock and GI bleeding*
- *The report notes communication failures and staff distractions due to the unit being very busy*

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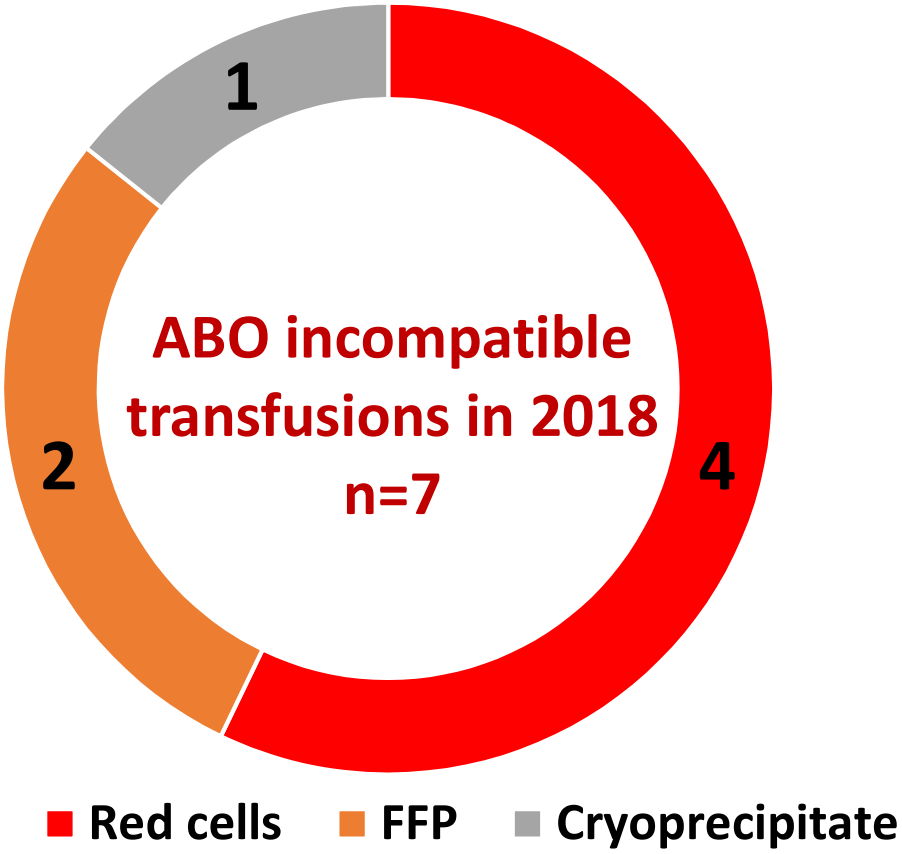

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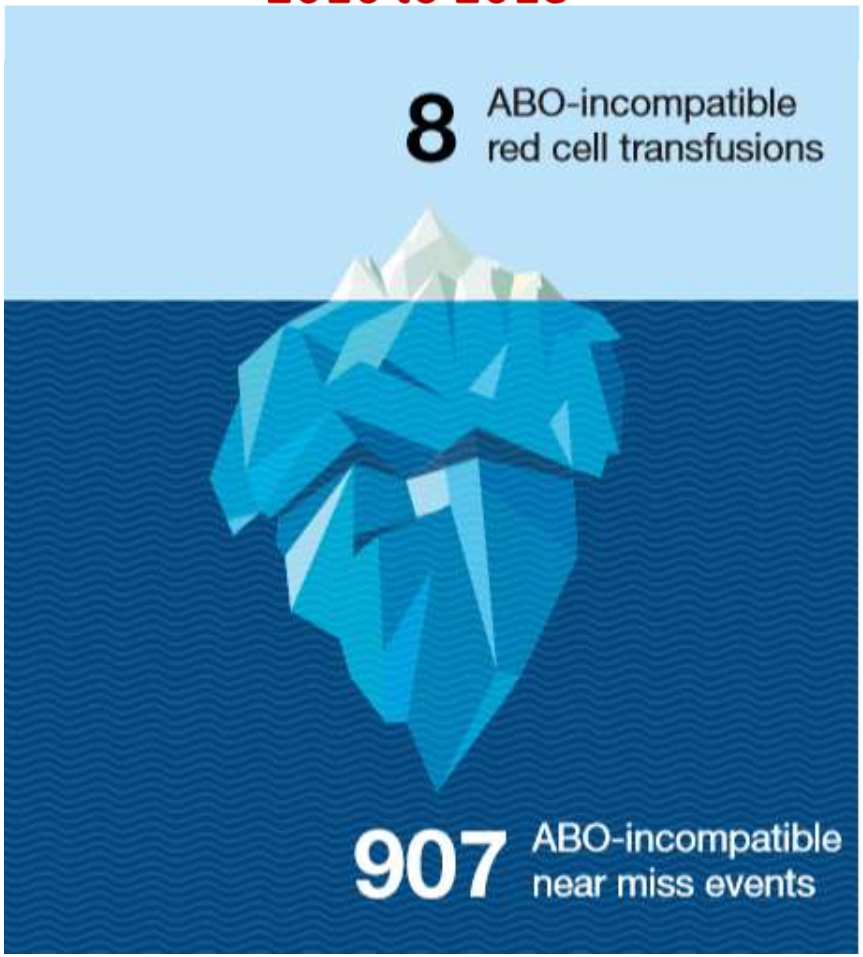
Clinical

Laboratory

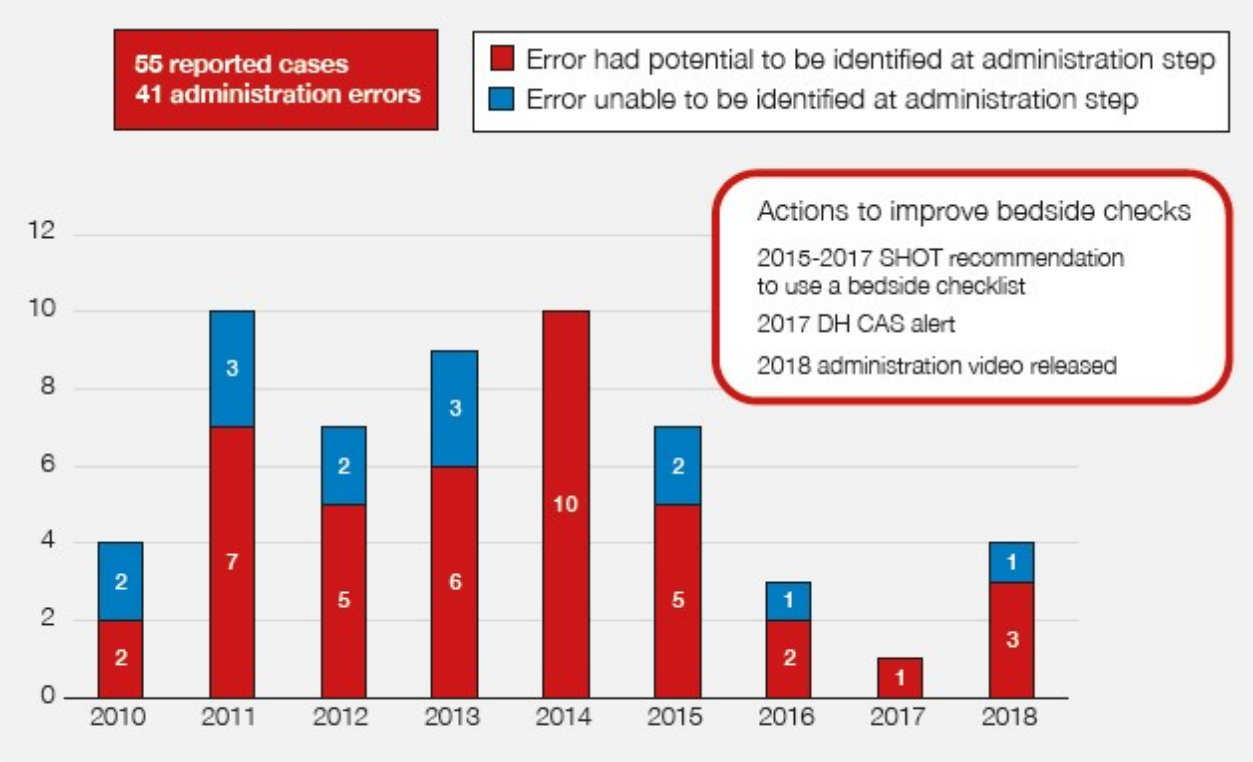
SHOT Serious Hazards of Transfusion

ABO-incompatible red cell transfusions 2016 to 2018



SHOT Serious Hazards of Transfusion

Number of ABO-incompatible red cell transfusions where the first error occurred or had the potential to be identified at the administration step 2010-2018



DH=Department of Health; CAS=central alerting system

Illustrative case 1:

Near miss – avoidable transfusion for one patient is associated with ABO-incompatible transfusion in another due to failure of bedside identification

- An elderly patient was admitted after a fall with two fractures
- Her haemoglobin (Hb) was 82g/L and she was transfused with one unit of red cells
- A second unit was collected but not given, as it was decided not necessary
- This decision should have been made before the unit was collected
- However, after checking the unit with the doctor at the nurses' station, transfusion of this unit was started in error on another patient who was also being transfused
- This wrong patient received ABO-incompatible red cells as a result and suffered major morbidity (Case 8.1 in Chapter 8, Incorrect Blood Components Transfused (IBCT)

Illustrative case 2 (1/2)

- A haemato-oncology day case patient **(group AB D-negative)** required transfusion of irradiated red cells
- The BMS took two units from the irradiated drawer but failed to notice one was **A D-negative** and the other **A D-positive**
- The BMS then failed to respond to the alert on the LIMS highlighting the group difference and issued both units
- The process failed again during the component labelling as the blood group difference between unit and patient was not noticed

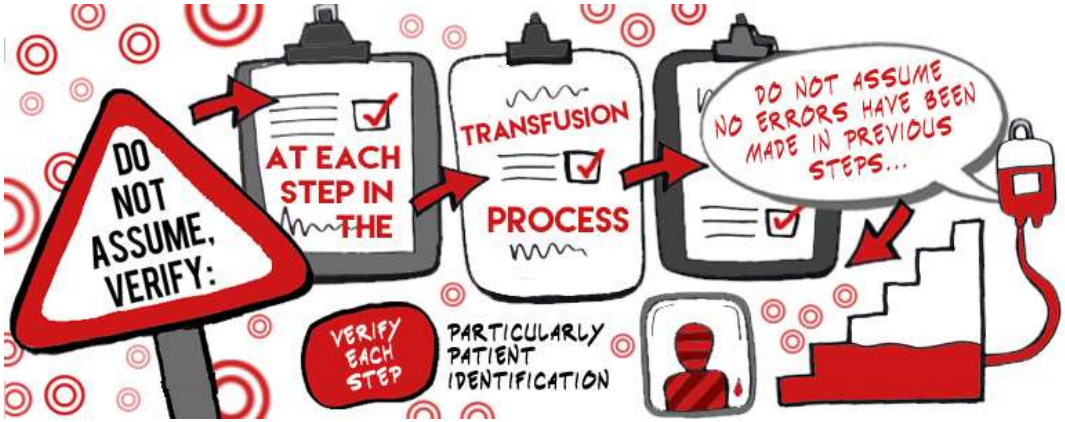
(Continued)

Illustrative case 2 (2/2)

- The clinical area did not have any competent staff on duty available to collect the red cells, so the same BMS checked out the components and again failed to notice the group difference
- The clinical area did not complete adequate bedside checks before transfusion and also missed the error
- This component selection error was discovered on a later sample from this patient, when it was identified that they had developed an anti-D antibody
- At the time of this incident the BMS involved had a history of stress and anxiety and the laboratory had an increased workload

Illustrative case 3

- A neonate required plasma exchange in the early evening out-of-hours during a shift handover
- Due to resource pressure on the laboratory and the fact that the laboratory was not familiar with neonatal transfusion, **group O plasma** was selected for a **group A patient**
- Soon after starting the shift the biomedical scientist (BMS) on duty was under pressure when clinical staff came to collect the FFP
- Assuming the previous BMS staff had selected the correct component and under pressure the BMS ignored the warning flag and overrode it
- The clinical staff were unaware that, unlike red cells, group O is not the universal plasma group
- The laboratory had logged a request with the laboratory information management system (LIMS) supplier to block issue of group O plasma components to non-group O recipients, but this work had not been completed



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Reports of pulmonary complications by year: 2008-2018

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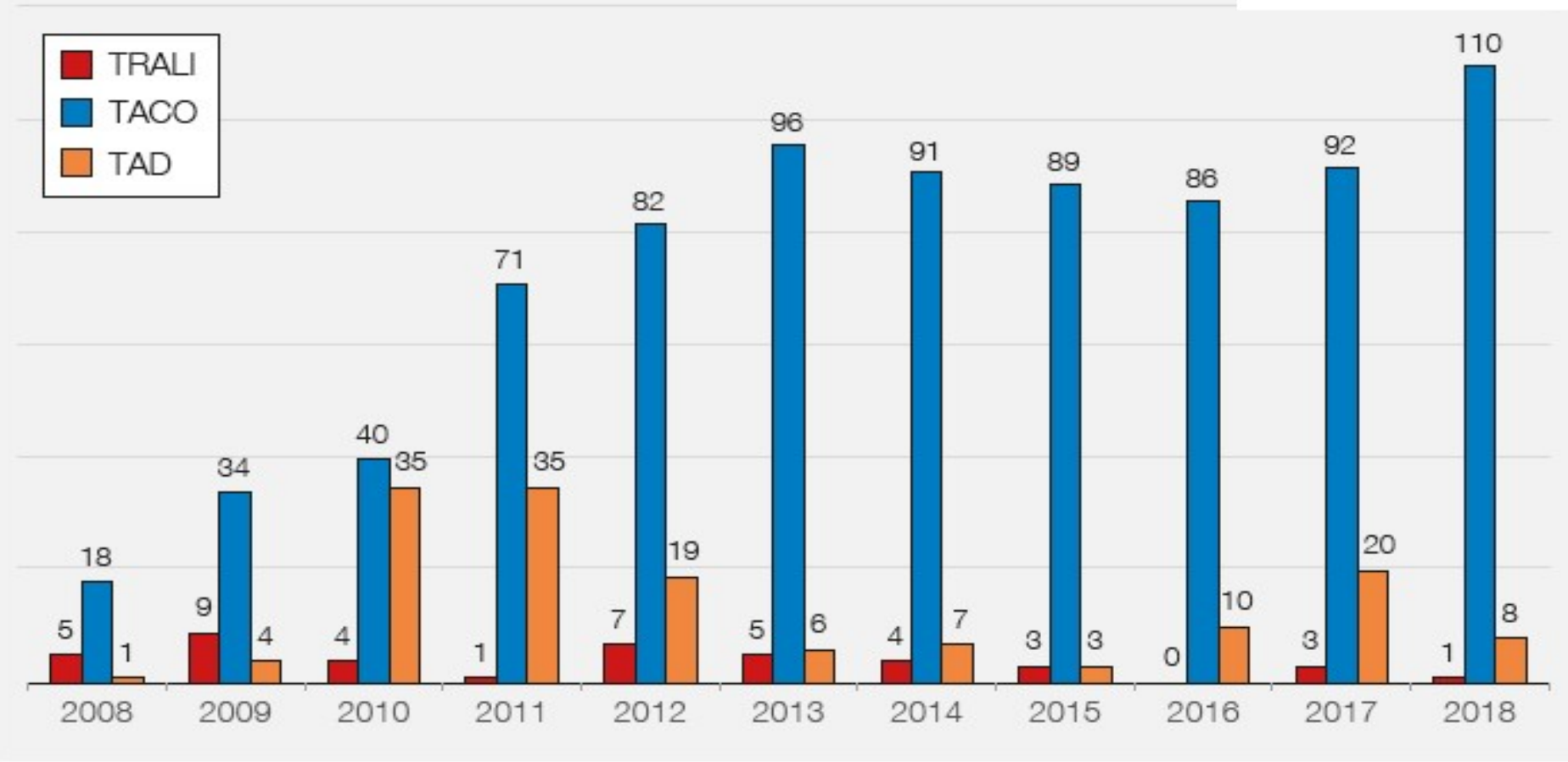

TRALI=transfusion-related acute lung injury; TACO=transfusion-associated circulatory overload; TAD=transfusion-associated dyspnoea

Updated TACO pre-transfusion checklist

TACO Checklist	Red cell transfusion for non-bleeding patients	If 'yes' to any of these questions
	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? Does the patient have severe anaemia?	1 • Review the need for transfusion (do the benefits outweigh the risks)?
	Is the patient known to have pulmonary oedema? Does the patient have respiratory symptoms of undiagnosed cause?	2 • Can the transfusion be safely deferred until the issue can be investigated, treated or resolved?
	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?	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

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.

TACO=transfusion-associated circulatory overload

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Illustrative case 4: 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

Illustrative case 5: Over-transfusion due to lack of monitoring of response to transfusion

- Elderly patient admitted to the Medical Admissions Unit with haematemesis and initial Hb 106 g/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

Illustrative case 6: 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
- Full recovery

Illustrative case 7: HDU admission in patient at increased risk of TACO after transfusion as a day case

- A 78 year old female with myeloma, wt 56 kg, was transfused 3 units of red cells as a day case despite being at increased risk of TACO (renal impairment, hypoalbuminaemia, age ≥70 years, low bodyweight)
- She developed fluid overload and pulmonary oedema with hypertension and hypoxia before the end of the third unit. She initially responded to diuretic and was sent home by a junior doctor, but was unable to lie flat all night because of shortness of breath
- She was readmitted, to the HDU, within 24 hours with pulmonary oedema and myocardial infarction

Illustrative case 8: Rapid correction of anaemia can precipitate TACO in the absence of other comorbidities and risk factors (1/2)

- A male in his 50s presented to the emergency department (ED) with a 3-4-week history of weakness and dizziness, and had felt unwell for the past 6 months
- He was hypotensive (blood pressure (BP) 92/47) but did not show signs of acute haemorrhage though there was some altered blood on rectal examination
- On admission his haemoglobin (Hb) was 34g/L, ferritin 26micrograms/L and the electrocardiogram (ECG) showed cardiac ischaemia
- He was transfused two units of red cells with a plan for endoscopy and intravenous (IV) iron the following day
- A third unit was planned if the post-transfusion Hb was <60g/L

(Continued)

Illustrative case 8: Rapid correction of anaemia can precipitate TACO in the absence of other comorbidities and risk factors (2/2)

- The first unit was transfused over 31 minutes and the second over 65 minutes
- After the second unit his oxygen saturations began to fall despite being on supplemental oxygen and his post-transfusion Hb was 51g/L
- A third unit was transfused over 125 minutes and he developed worsening hypoxia, dyspnoea and crackles on chest auscultation
- The chest X-ray showed an enlarged cardiac silhouette and pulmonary congestion
- He was treated with diuretics and improved
- Fortunately, the attending doctor cancelled the fourth unit which had been planned

Illustrative case 9: TACO and death following accidental overtransfusion of three times the volume required

- A preterm infant required a double volume exchange for high bilirubin
- The baby deteriorated markedly 1 hour after the exchange transfusion was commenced
- At this point it was noticed that nearly three times the required volume had been administered (175mL) than had been removed (70mL)
- This was due to three syringes of blood being accidentally run concurrently
- The baby developed pulmonary oedema and then an intracranial haemorrhage
- The neonatal unit involved performs approximately 5-10 procedures per year but the investigation commented that this is still sufficiently infrequent to mean that many nurses and members of the junior medical team will have limited experience

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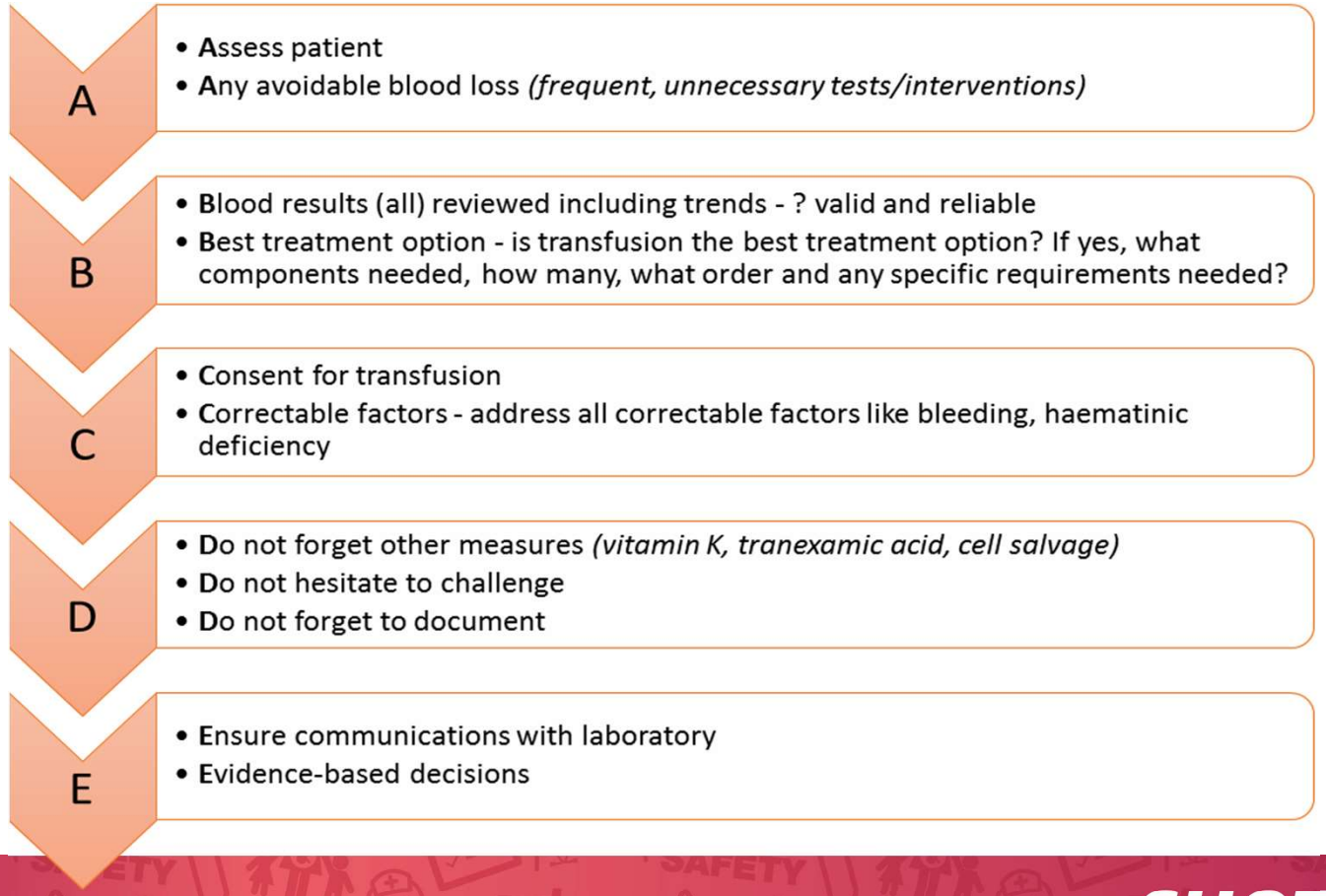
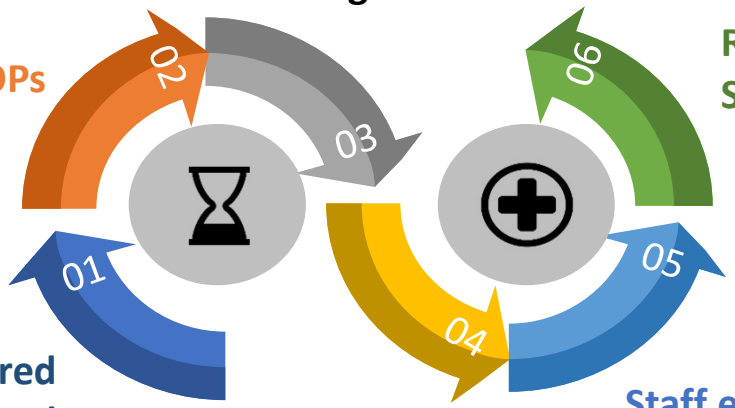
Serious Hazards of Transfusion

The A-E Decision Tree to facilitate decision making in transfusion



To make an impact…



Redesigning education and training

CLEAR SOPs

Review and listen
Share learning

Design user centred processes and adequate resources including staffing and skills/experience mix

Investigating incidents
Learning from near misses
Systems thinking

Staff engagement and psychological safety

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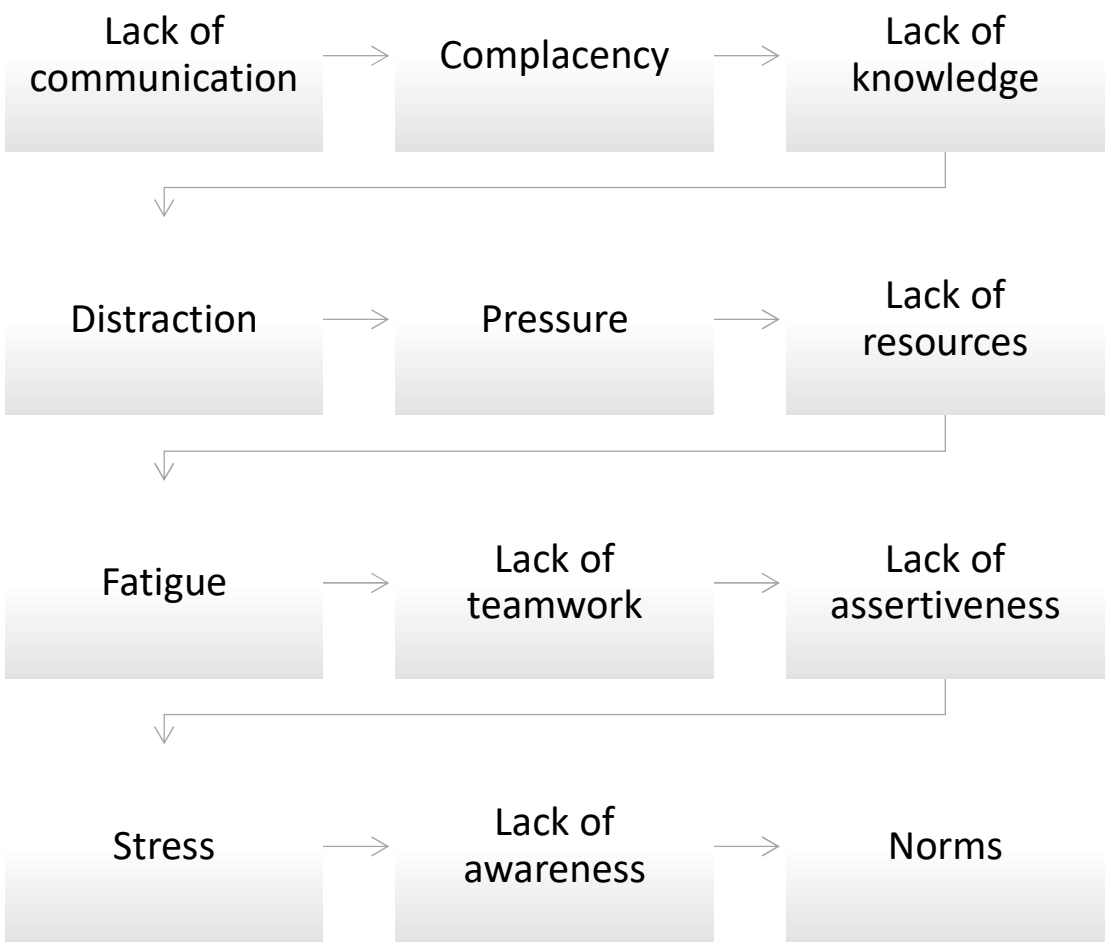
The dirty dozen



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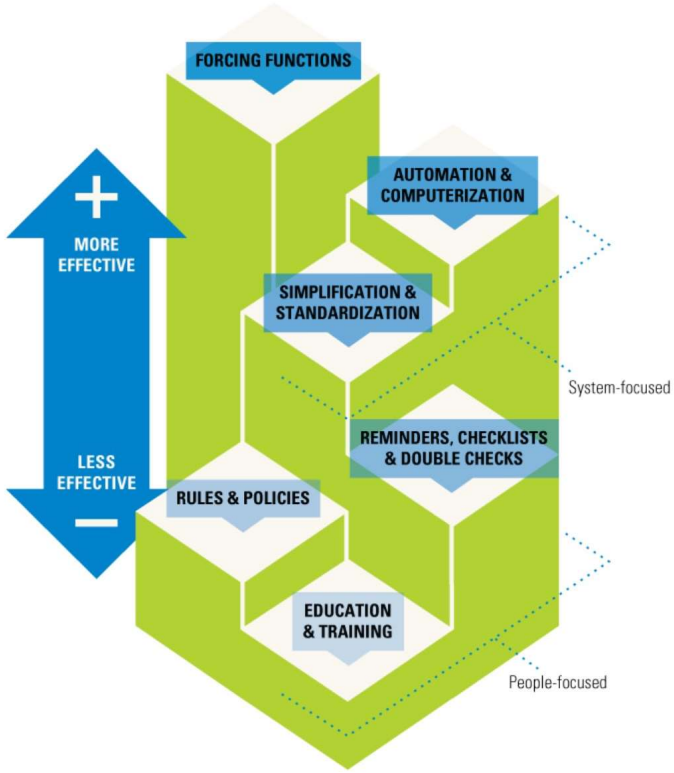

https://www.longwoods.com/content/22845/healthcare-quarterly/from-discovery-to-design-the-evolution-of-human-factors-in-healthcare

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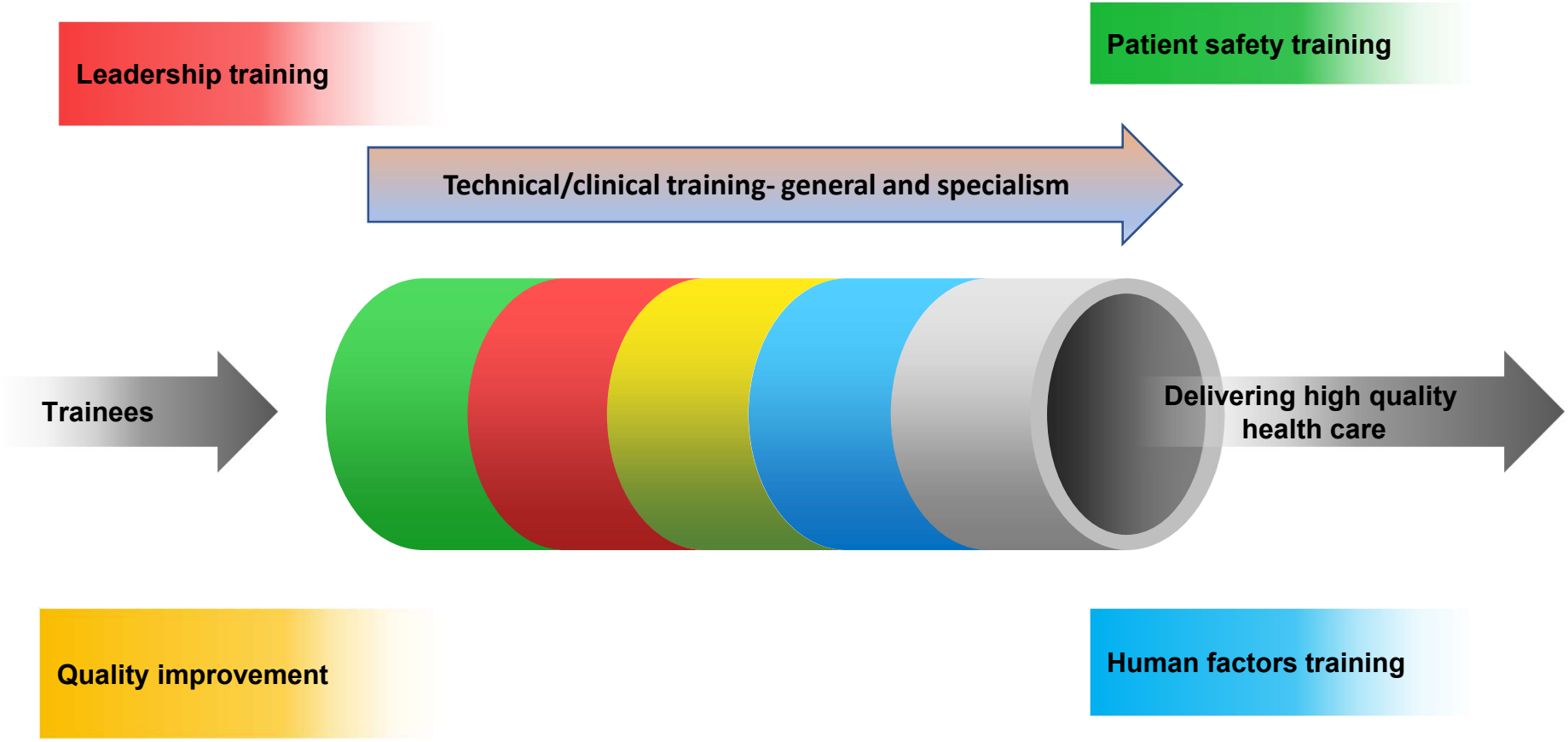
The training agenda…..



SHOT 2018 RECOMMENDATIONS

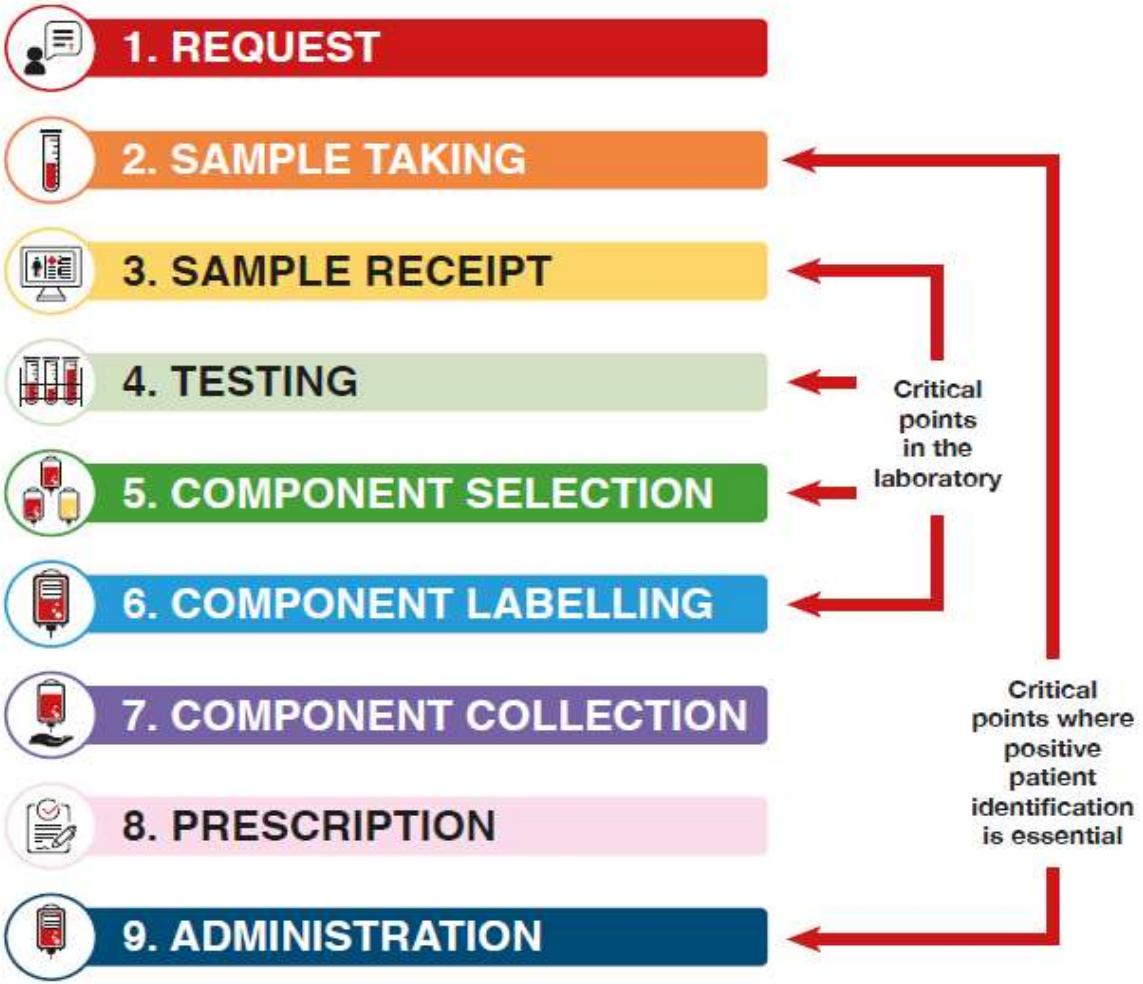
All NHS organisations must move away from a blame culture and towards a just and learning culture

All clinical and laboratory staff should be encouraged to become familiar with human factors and ergonomics concepts

All transfusion decisions must be made after carefully assessing the risks and benefits of transfusion therapy. Collaboration and co-ordination among staff are vital

SHOT Serious Hazards of Transfusion

Transfusion process (nine steps)



Note: Once a decision to transfuse is made, the authorisation or prescription may be written at variable times during this sequence, but ***must be checked at the final stage.***

SHOT Serious Hazards of Transfusion

Everyone can make a difference and everyday is a chance to do so!

Acknowledgements

- The SHOT team
- The Working Expert Group
- The Steering Group
- MHRA haemovigilance team
- The vigilant reporters and hospital staff who share their incidents
- The UK Forum for funding

For further information visit: www.shotuk.org

https://www.shotuk.org/resources/current-resources/videos/

Annual SHOT Symposium 2020

Tuesday 07 July

The Lowry Theatre, Salford Quays, Manchester

For further details regarding the Symposium, please visit
https://www.shotuk.org/annual-shot-symposium