

# Human/System errors in transfusion - Insights from SHOT

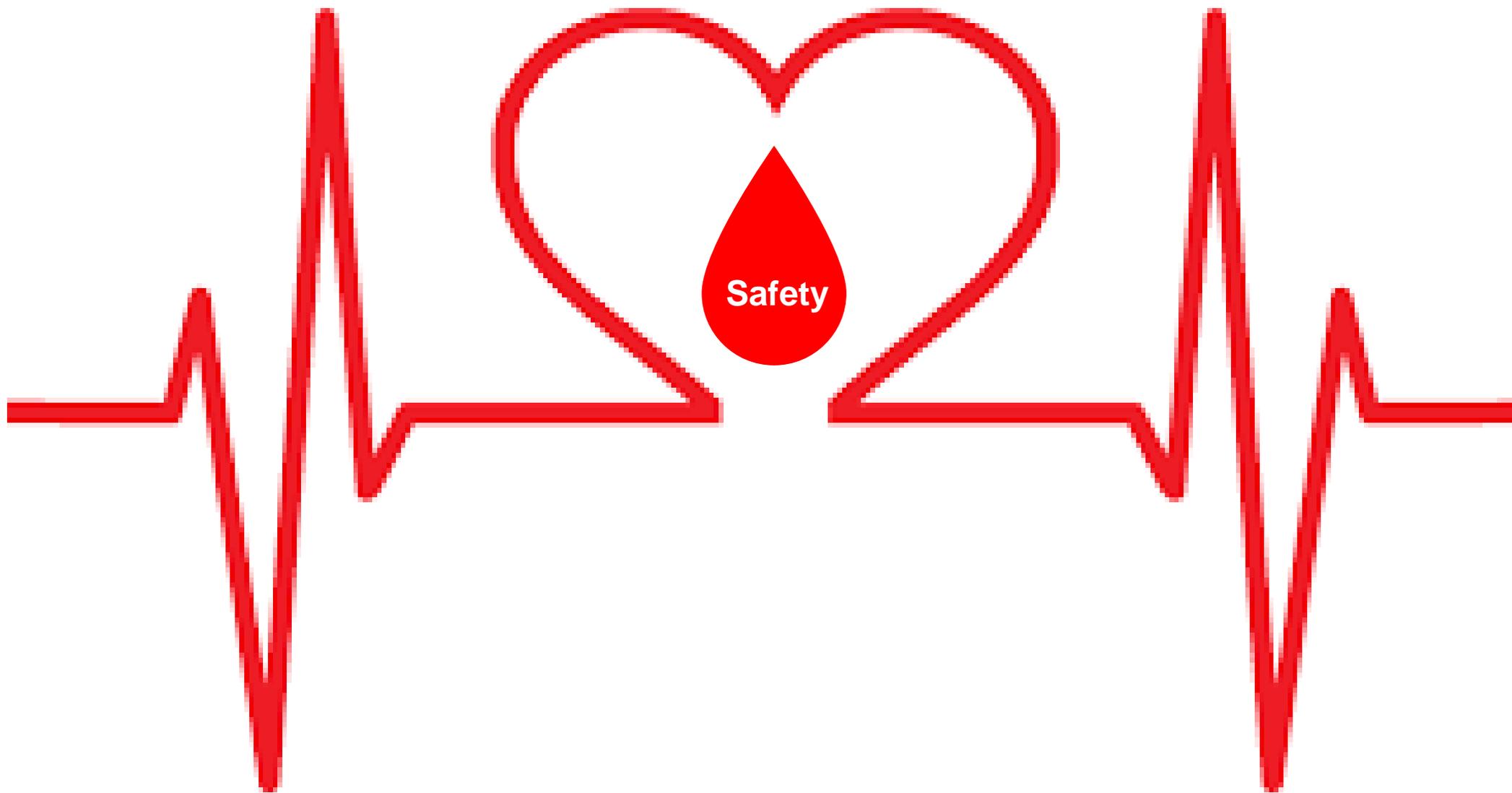
Shruthi Narayan

A GOOD SAFETY CULTURE IS NOT GIVEN,  
IT IS BUILT OVER TIME





*Thank You!*





SHOT collects and analyses information on transfusion reactions and adverse events from all healthcare organisations in the UK that are involved in blood transfusion

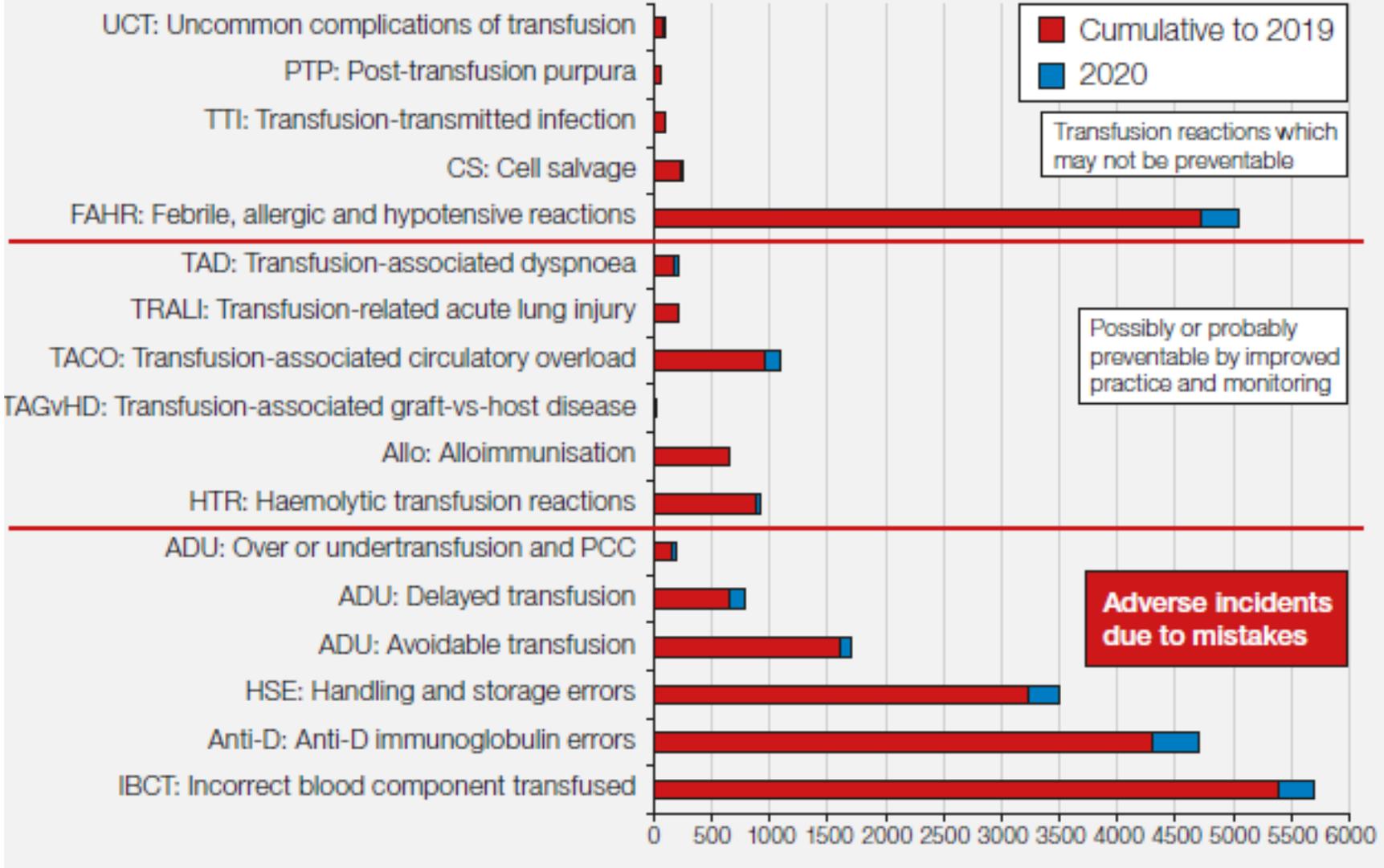


This includes transfusion of red cells, plasma, cryoprecipitate and platelets. Additionally SHOT has been collecting errors related to anti-D immunoglobulin administration, immune anti-D cases and errors related to prothrombin complex concentrates

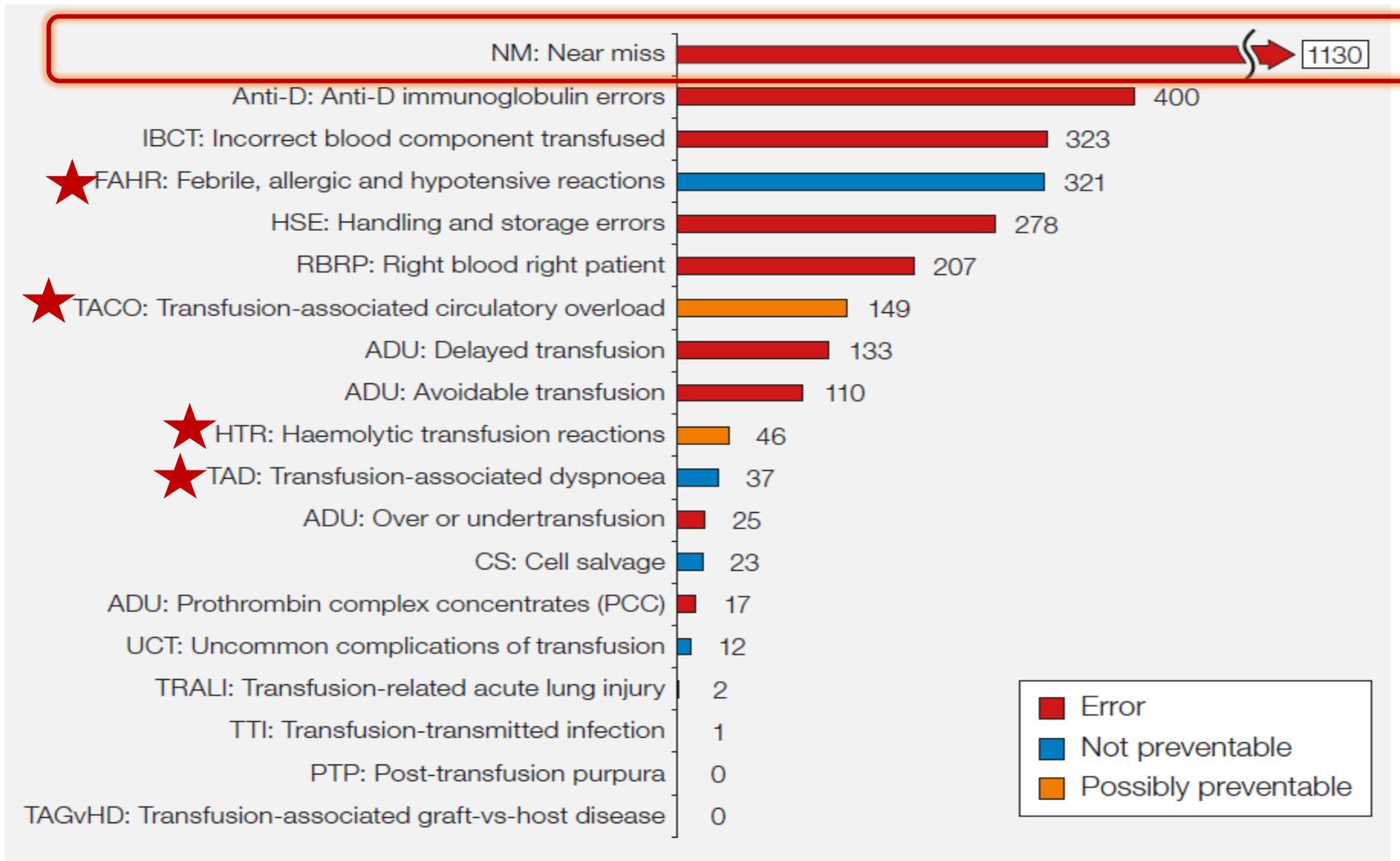


SHOT is funded by the 4 UK Blood Services and is affiliated to the Royal College of Pathologists. Its activities are overseen by a Steering Group whose membership includes representatives from the Royal Colleges (medical and nursing) and other specialist societies

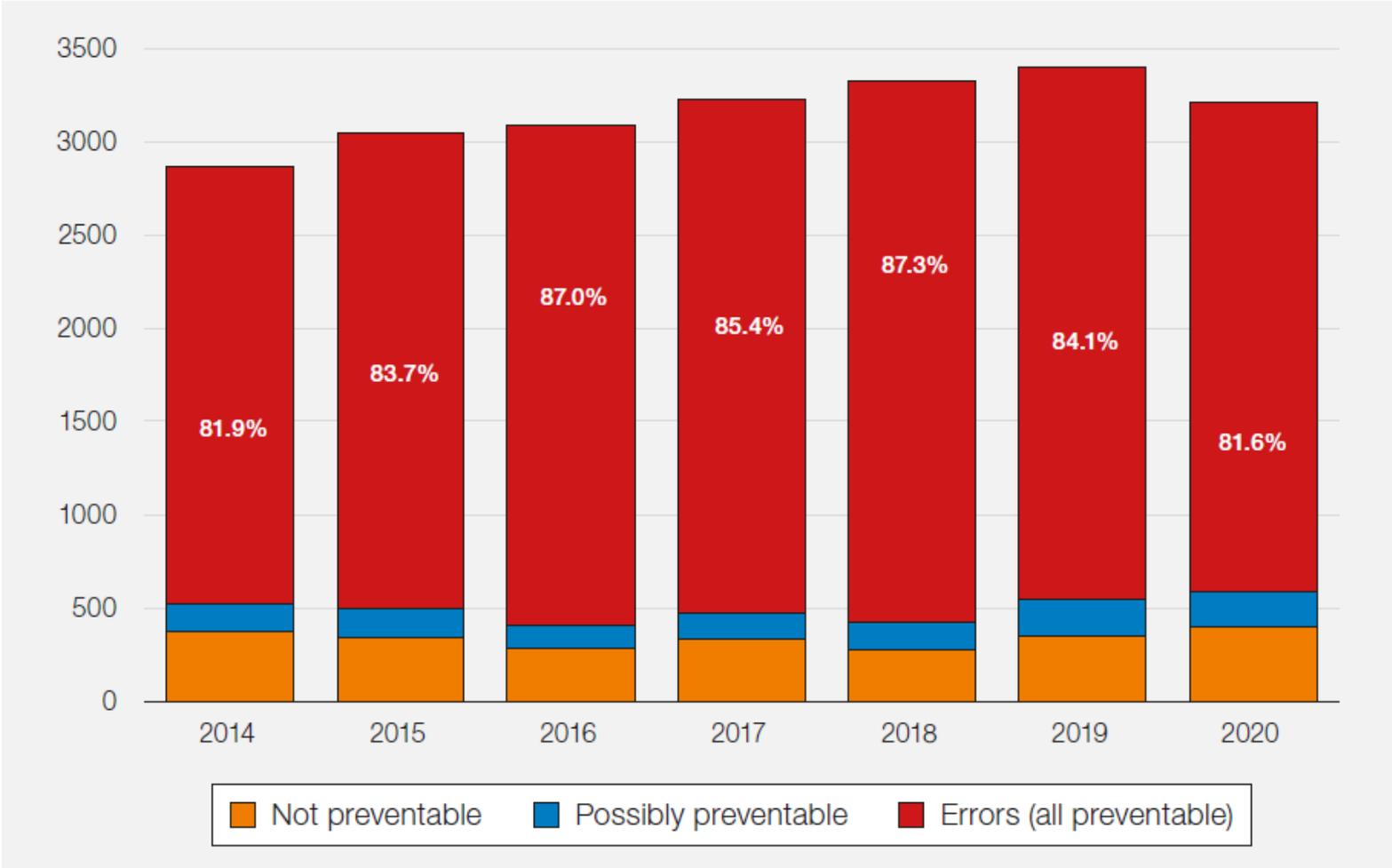
# Cumulative data for SHOT categories 1996-2020



# Summary data for 2020, all categories (includes RBRP and NM) (n=3214)

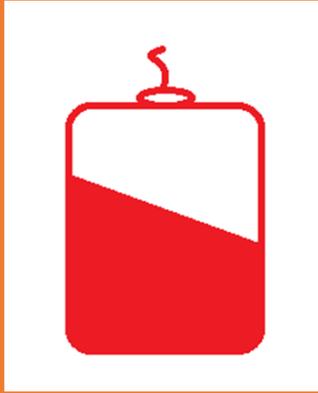


# Errors as a percentage of total reports 2014- 2020



# What are the impacts of errors in transfusion?

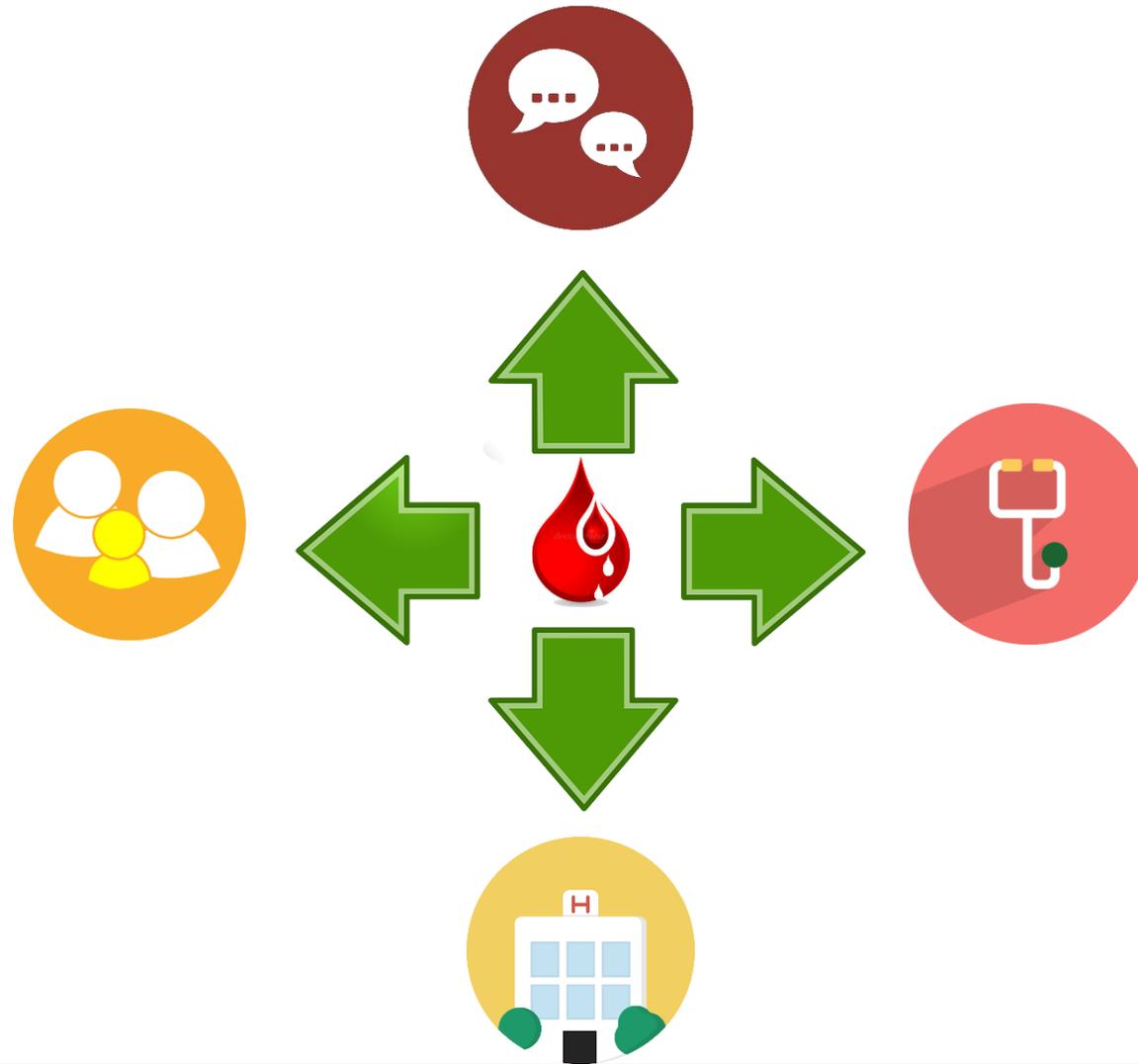
No patient impact



Fatality



# What are the impacts of errors in transfusion?



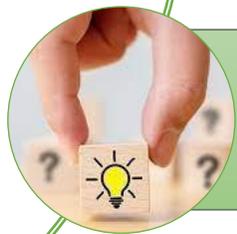
# Key questions



Are we asking the right questions during incident investigations?



Are we identifying the right CAPA? How effective are the actions?

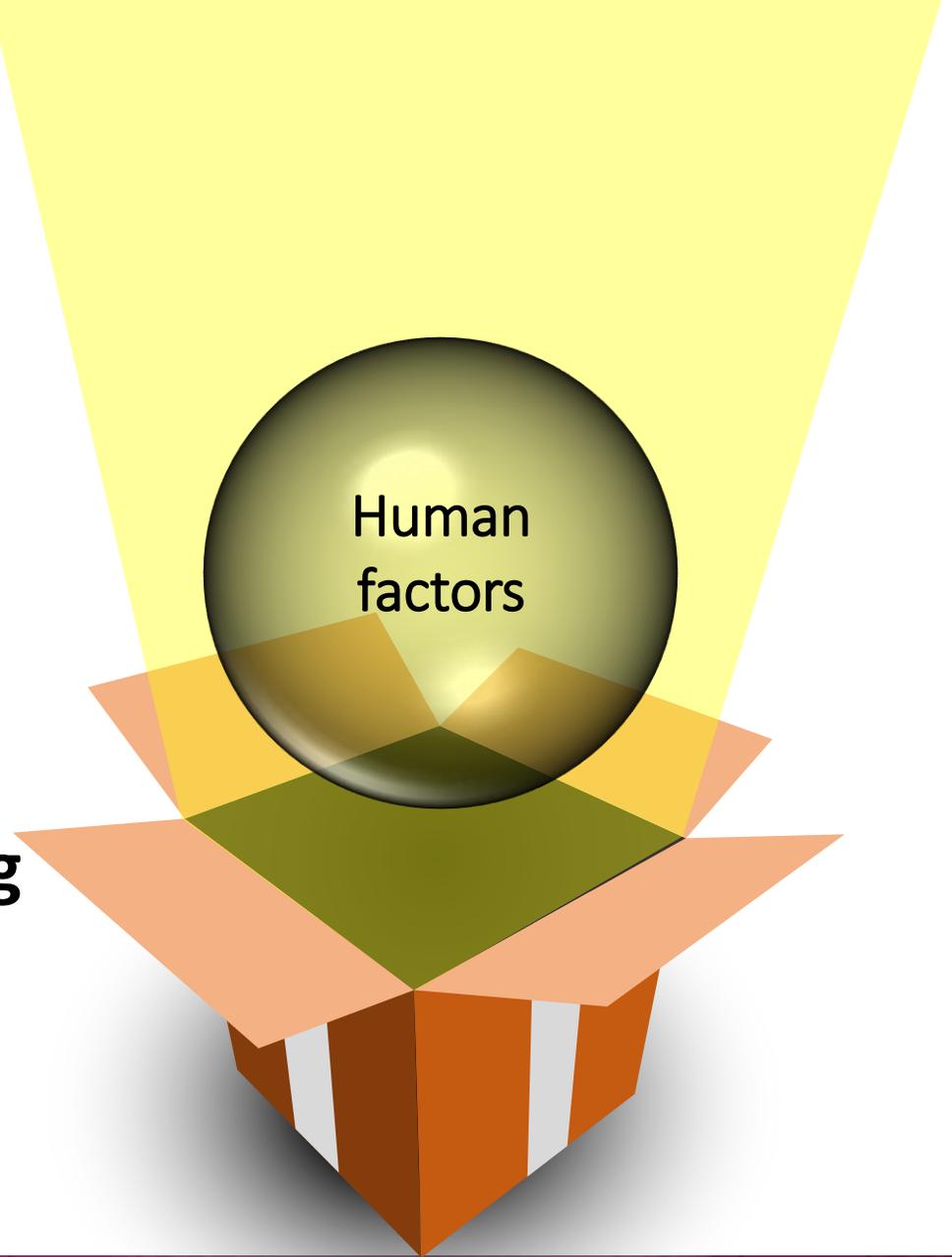


What more can be done? Moving from reactive to a proactive approach

## **Human factors**

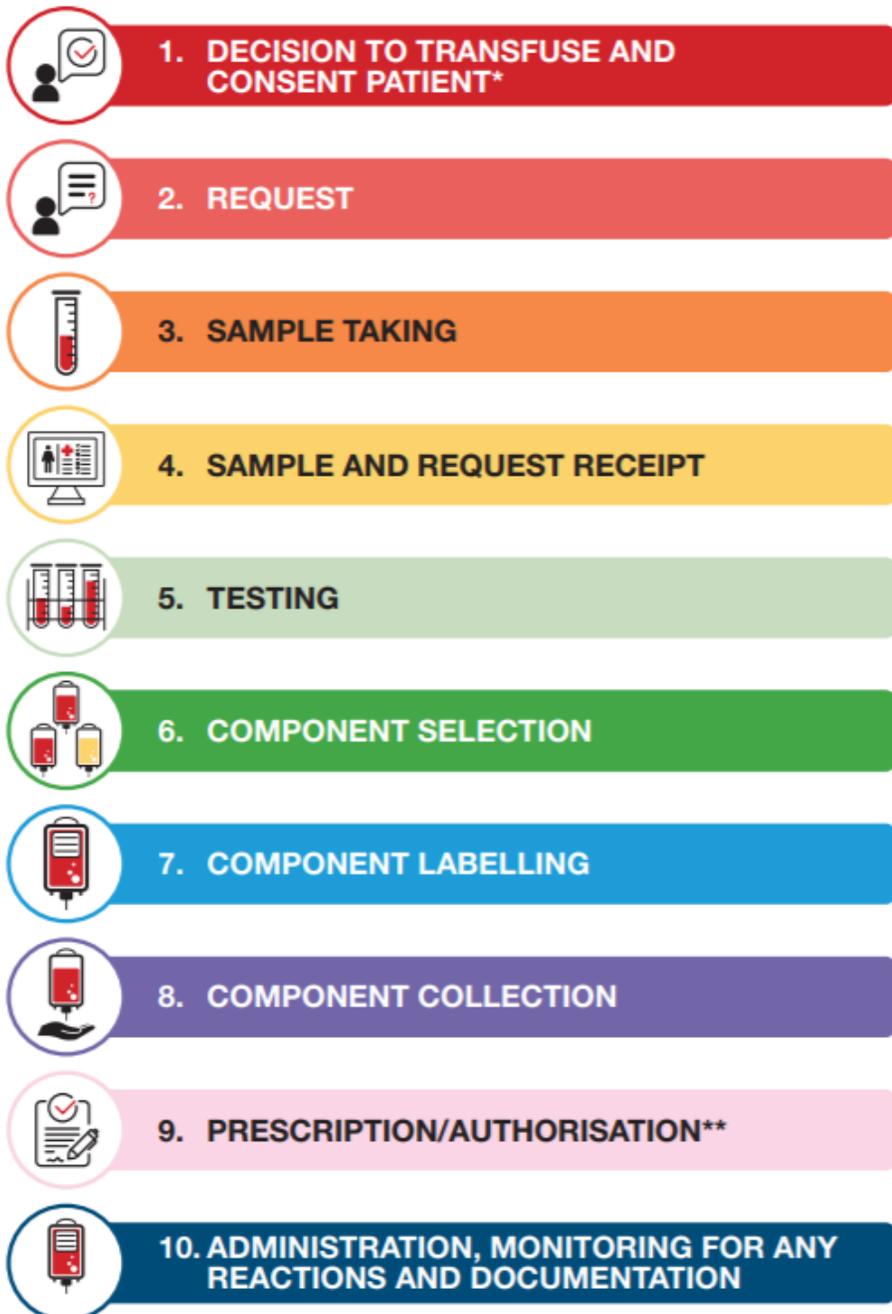
---

**“The scientific discipline concerned with the understanding of interactions among humans and other elements of a system”**



# 'Human factors' does not mean focusing on humans alone





*\*Note that the pre-transfusion sample may have been taken in advance (for e.g. pre-op) while the decision to transfuse is made at a later date.*

*\*\*Once the decision to transfuse has been made, the prescription/authorisation may be written at variable times during the sequence but must be checked at the final stage.*

*Staff are encouraged to use the SHOT Safe Transfusion Checklist with every transfusion episode.*

**Critical points in the laboratory**

*Misidentification of patients is a significant cause of avoidable harm. Patient identity must be verified effectively and accurately at every step in the transfusion pathway. All staff must be aware of the importance of correct patient identification and this must be confirmed in accordance with local policies.*

**Critical points where positive patient identification is essential**



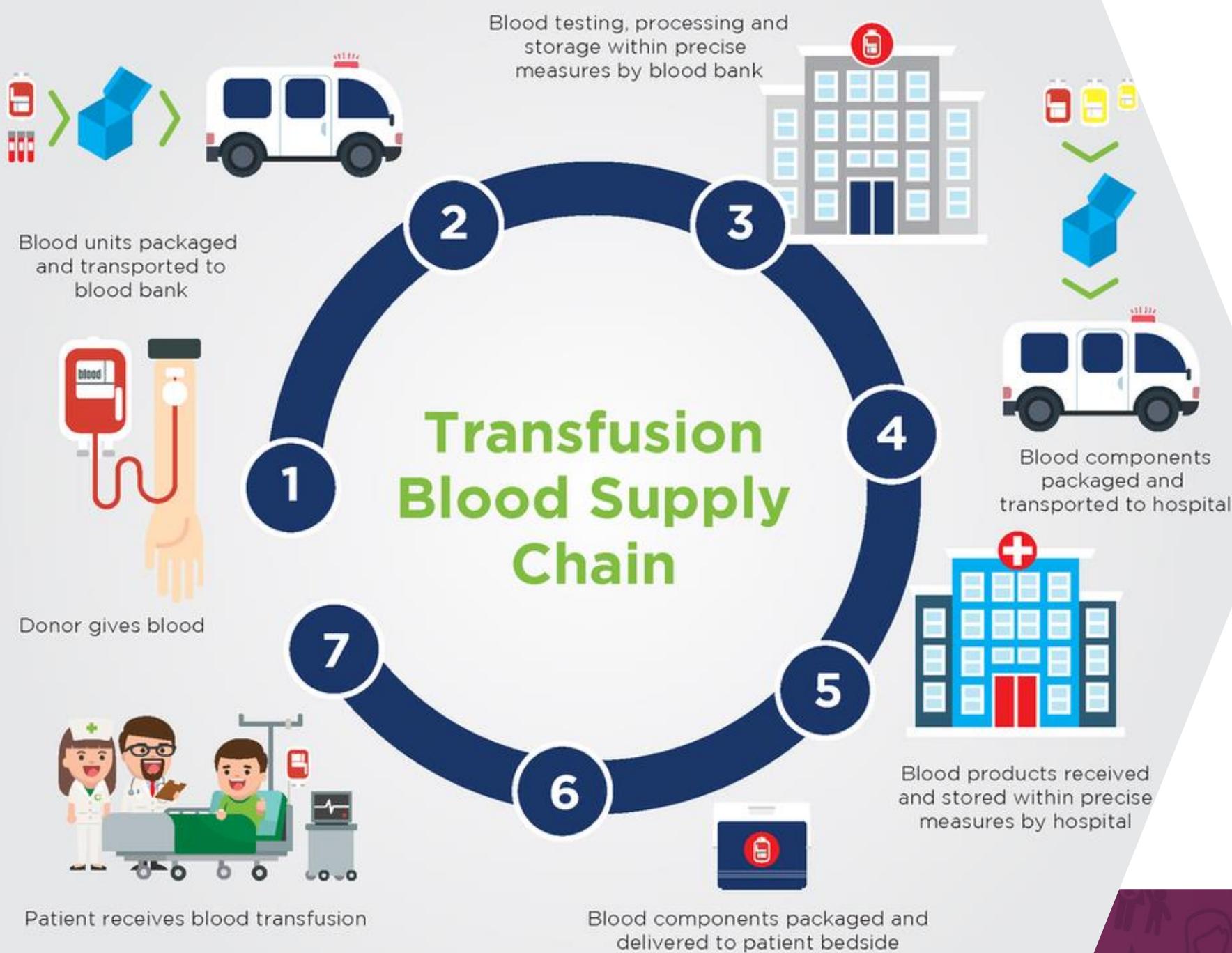
Designing  
policies and  
processes

Work  
instructions  
and  
equipment

Training,  
safety  
culture and  
environment

Investigating  
when things  
go wrong

Human factors principles are important in all these aspects



**Human factors principles are important in all aspects of patient care and at every step in transfusion: vein to vein**

# SHOT Human Factors Investigation Tool (since 2016...)



**Staff**



**Environmental**



**Organisational**



**Government/  
Regulatory**

Staff asked to score 0-10 under each category as being key factors identified whilst investigating incidents. This has been updated to incorporate the Yorkshire Contributory Factors Framework since Jan 2021. A training package is available from the SHOT website

# SHOT HFIT observations



The introduction of the HFIT within the reports submitted to SHOT paved the way for incorporating human factors principles when reviewing these transfusion incidents



Over a third of incidents (973/2857, 34.1%) were scored for a single contributory factor and the vast majority of these, 933/973 (95.9%) were given a score only for the individual staff member(s)



Over the 5 years of this study there has not been a major change in the distribution of scores given to the four human factors, although the trend is beginning to demonstrate that staff assign slightly less responsibility to the staff members, especially if the HF educational material has been used



# SHOT HF Recommendations



Staff involved in investigating incidents should be fully trained in techniques for effective investigations, including an understanding of human factors methods



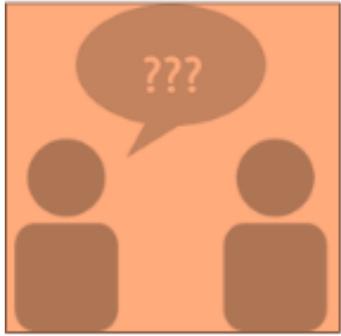
Investigations should identify, and include improvement actions, for all the contributory factors involved



The nine key principles outlined in the white paper titled 'Learning from Adverse Events' published by the Chartered Institute of Ergonomics and Human Factors (CIEHF, 2020) should be applied to investigating transfusion incidents in order to help with understanding a human factors perspective. A link to the paper is in the chapter resources section



# The dirty dozen



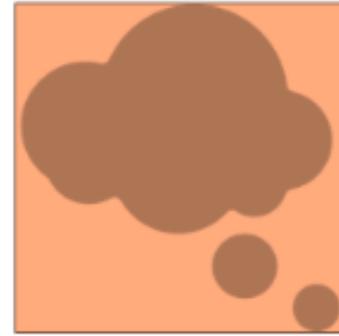
Poor  
Communication



Complacency



Lack of  
Knowledge



Distraction



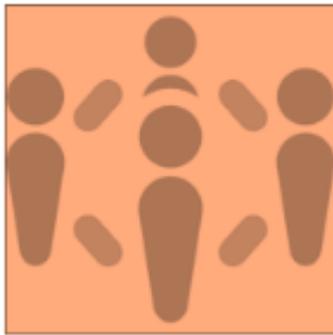
Stress



Lack of  
Resources



Pressure



Lack of  
Teamwork



Loss of  
Awareness



Accepting the  
Norms

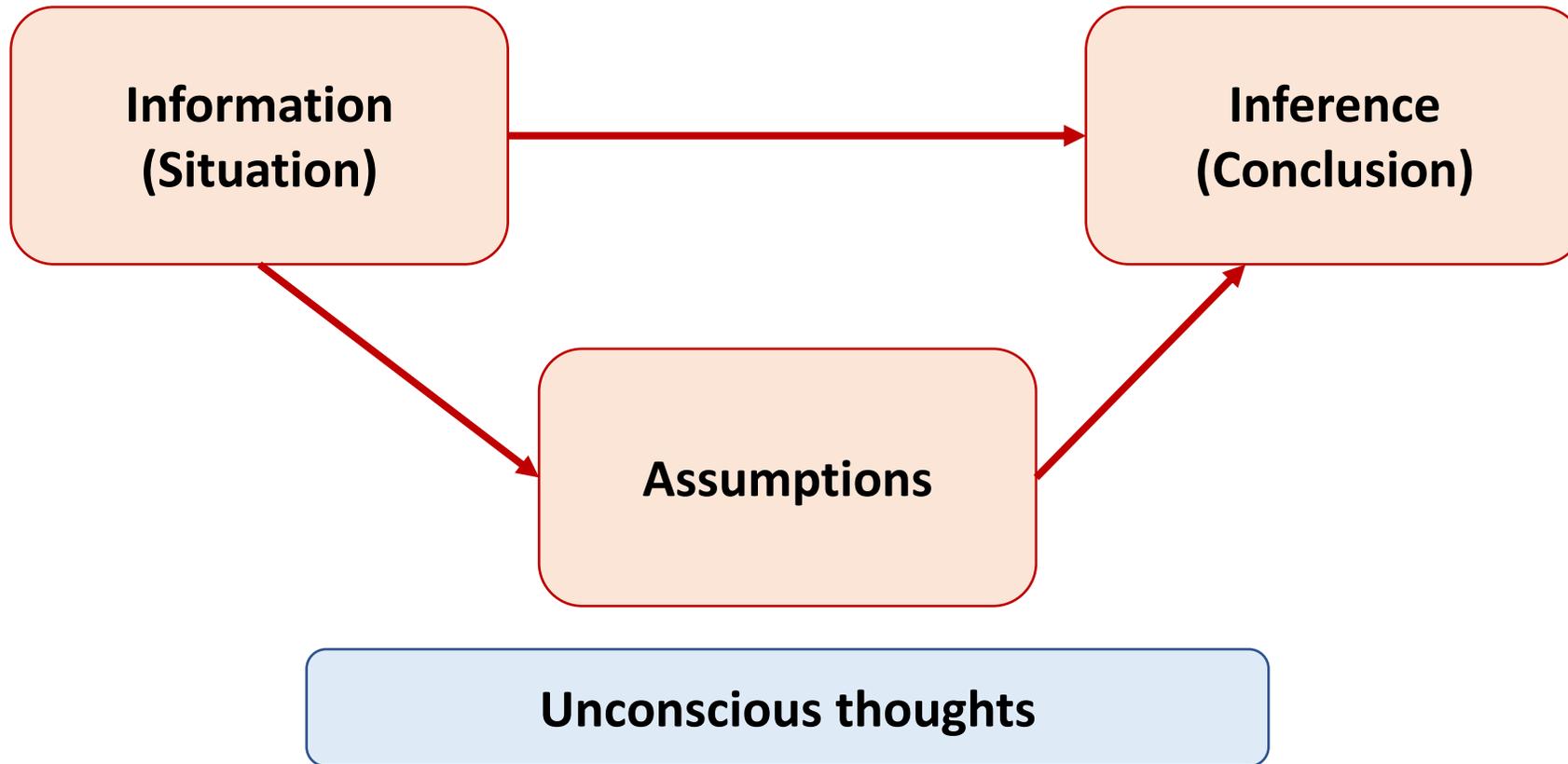


Fatigue



Lack of  
Assertiveness

# Cognitive biases as sources of errors



Cognitive biases are cognitive short-cuts used to aid our decision-making and can contribute to errors in healthcare but can be mitigated through various measures.

Find out more here:  
<https://www.shotuk.org/wp-content/uploads/my-images/SHOT-Bite-12-Cognitive-Bias-1.pdf>

# Illustrative cases for cognitive bias

## Case 1



- A young patient in mid-20's received 2 units of fresh frozen plasma(FFP) and 2 units of cryoprecipitate out of hours in error instead of 4 units of FFP prior to computerised tomography guided biopsy for a mediastinal mass
- The cryoprecipitate was stored in the wrong location in the freezer and staff failed to check the components prior to thawing and issue, assuming all four to be FFP. Staff collecting the component and administering also failed to identify the error and this was only noticed by laboratory staff the next day

## Case 2



- Two units of red cells were inappropriately issued electronically and transfused to a patient in her mid-30's. Antibody screen was negative, but patient was known to have historical anti-E antibodies
- Staff failed to heed a laboratory information management system alert about requirement for phenotyped blood for this patient. Fortunately the units were suitable ('E' negative) and there was no adverse patient impact, but a serological crossmatch should have been performed

# Cognitive biases evident in these cases:

Assumption  
bias

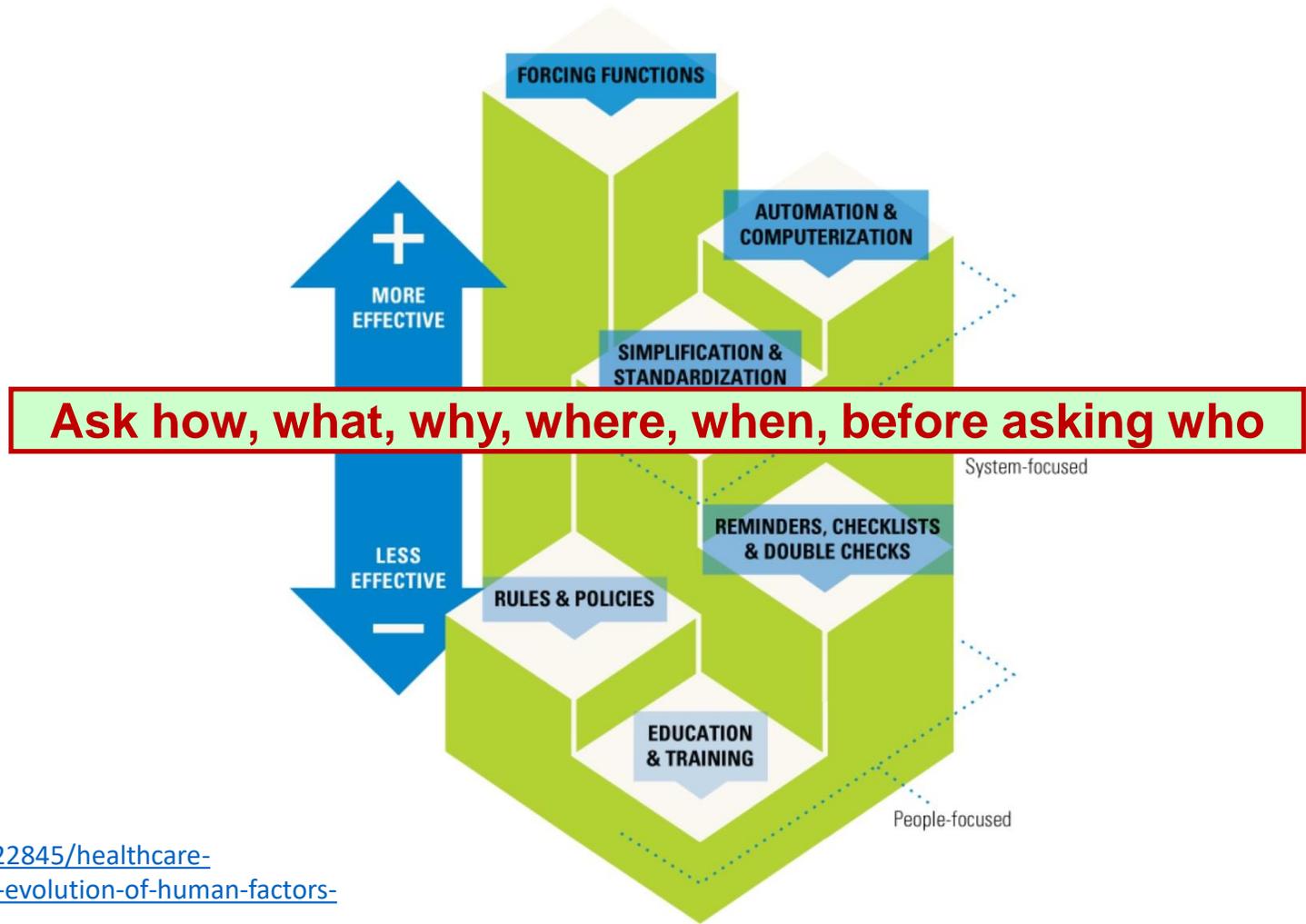
Inattentional  
blindness

Decision  
fatigue?

# Corrective and Preventive Actions

- **S**pecific – articulate and understandable
- **M**easurable - verified that is solving the problem, means of evaluating
- **A**chievable— can be achieved within the resources and time frame
- **R**elevant- related to the cause(s) of the incident
- **T**ime bound— specified time to complete the actions

# The Hierarchy of Intervention Effectiveness



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

# Action examples

Deficiency noted in investigation – staff not trained to respond to fridge temperature excursion alert

## Good action



Create training plan and competency assessment covering fridge alerts and deliver training to all staff



Target date – within 4 weeks (Ensure staff trained prior to lone working shift)



Action by – transfusion laboratory manager



Evidence – signed training and competency assessment documents

## Poor action



Include in next staff training session



Target date – within 6 months



Action by – transfusion laboratory

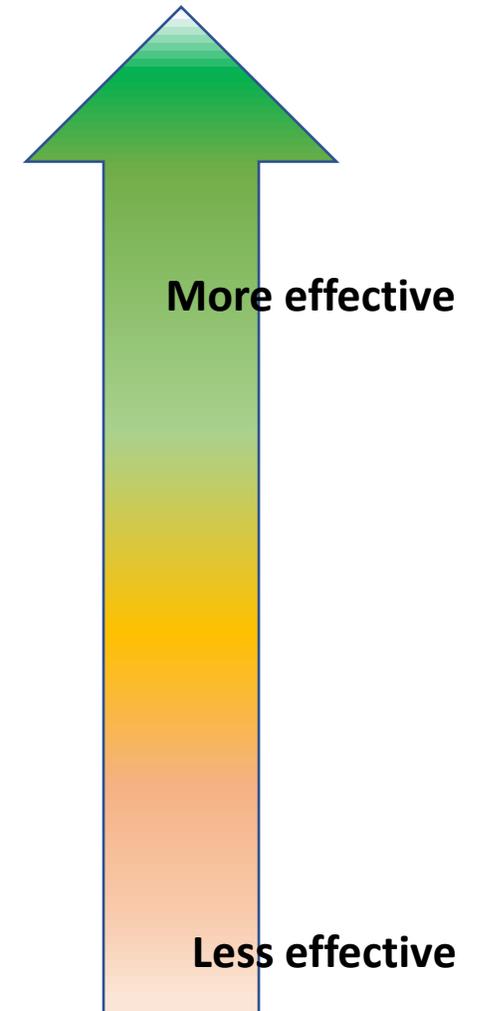


# Intervention Hierarchy

**Forcing functions:** robust process that include barriers and fail-safes, automation, and computerisation. These are the most effective barriers but are usually the hardest to implement. Reliance on systems to ensure safe practice, but can be subject to technology complacency, flag fatigue and short cuts if not set up correctly.

**System focussed:** standardisation, protocols and procedures, warnings, alerts, reminders, checklists, and robust checking. Partial reliance on humans and partial reliance on systems. Can be used as interim measures whilst more effective forcing functions are being explored.

**People focussed:** education and training, rules, and policies, even if applied to teams rather than individuals these are known to be ineffective. They are easy to implement and often used as the first line of defence. Reliant on humans to remember safe practice.



# Effective Interventions

**Making the most of your interventions:** The following guide can help ensure that the interventions identified are effective and fit for purpose:



## Process

As simple as possible, as complex as necessary

Fail-safes and barriers (visual and physical) to error

Check points for safety

Reviewed for fitness for purpose



## LIMS & Automation

Functionality utilised to its full potential

Appropriate rules and meaningful alerts

Alerts not easily overridden with audit trail of override reasons



## SOPs

Clear and concise instructions for methodology

Clear escalation pathways and instructions for discrepancies

Regular review and updates



## Training

Planned and delivered to all relevant staff

Clear learning outcomes

Follow up for learning assurance/regular sessions



## Checklist

Clear purpose for design

Utilise best practice

Succinct reminder not an explanation of process

Clear pause points for use

# Review the effectiveness



# Main recommendations from the 2018 Annual SHOT Report



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

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

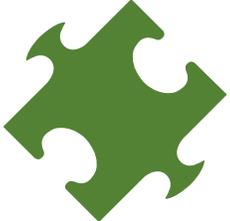


All transfusion decisions must be made after carefully assessing the risks and benefits of transfusion therapy. Collaboration and co-ordination among staff are vital

<https://www.shotuk.org/wp-content/uploads/myimages/2018-Recommendations-Survey-Summary.pdf>

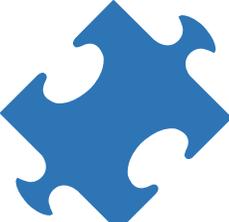


# Main recommendations from the 2019 Annual SHOT report



## Accurate patient identification

Accurate patient identification is fundamental to patient safety. Organisations must review all patient identification errors and address the causes of patient misidentification with use of electronic systems, and empowerment of patients and staff



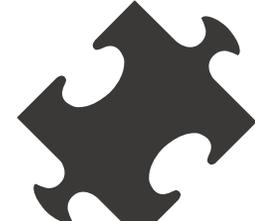
## Holistic training of all staff in transfusion

Clinical and laboratory staff should be trained in fundamentals of transfusion, human factors, cognitive biases, investigating incidents and patient safety principles



## Safety principles

All healthcare organisations should incorporate the principles of both Safety-I and Safety-II approaches to improve patient care and safety. Healthcare leaders should proactively seek signals for improvement from unsafe, suboptimal as well as excellent care



## Interlinked systems

Healthcare management must recognise that safety and outcomes are multifaceted, a linear view of safety does not fully acknowledge the interdependencies of resources including their leadership, adequate staffing and knowledge. Leaders should ensure these are all in place to improve patient safety

# Main SHOT recommendations from the 2020 Annual SHOT Report

Effective and reliable transfusion information technology systems should be implemented to reduce the risk of errors at all steps in the transfusion pathway, provided they are configured and used correctly

Main recommendation 1

Transfusion delays, particularly in major haemorrhage and major trauma situations, must be prevented. Delays in provision and administration of blood components including delays in anticoagulant reversal, particularly in patients with intracranial haemorrhage, can result in death, or serious sequelae. Every minute counts in these situations

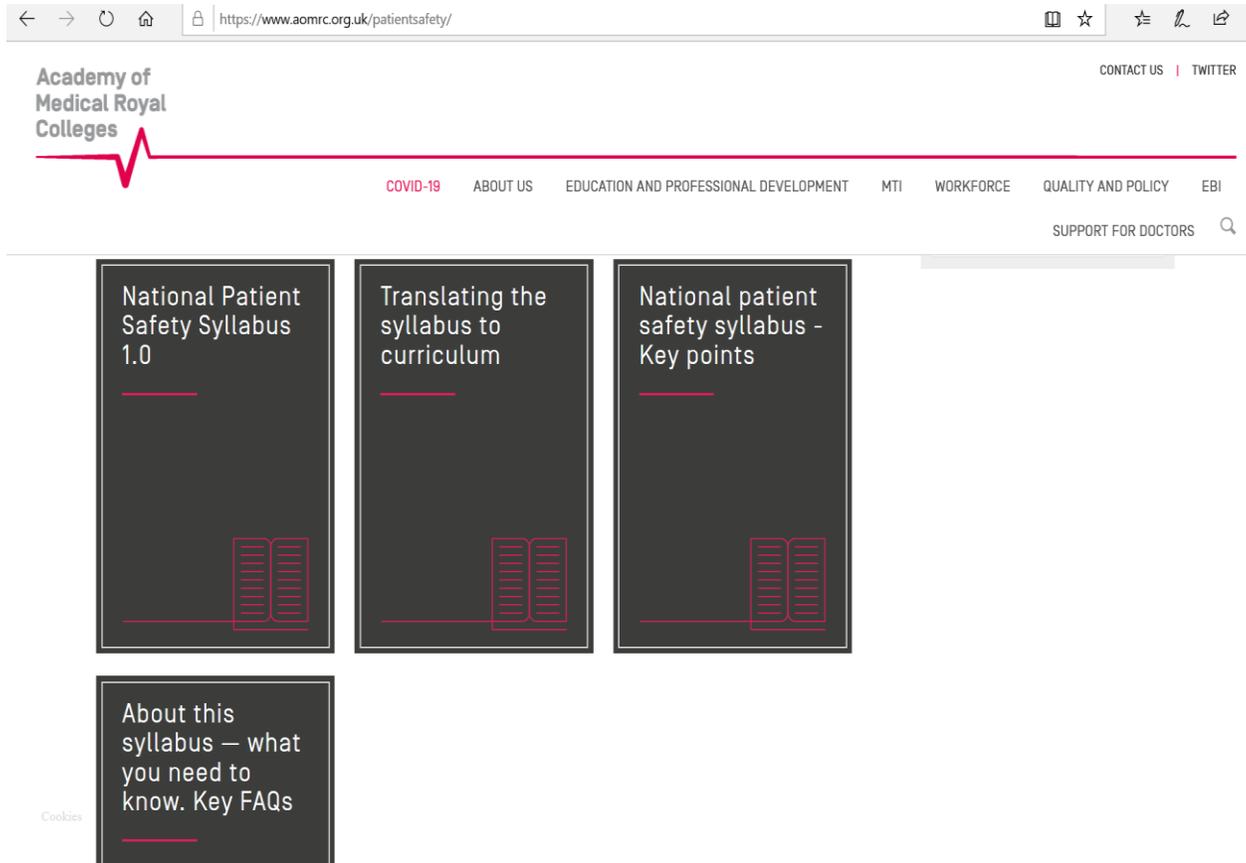
Main recommendation 2

Effective investigation of all incidents and near miss events, application of effective corrective and preventive actions, and closing the loop by measuring the effectiveness of interventions should be carried out to optimise learning from incidents

Main recommendation 3

# National Patient Safety Syllabus Jan 2020

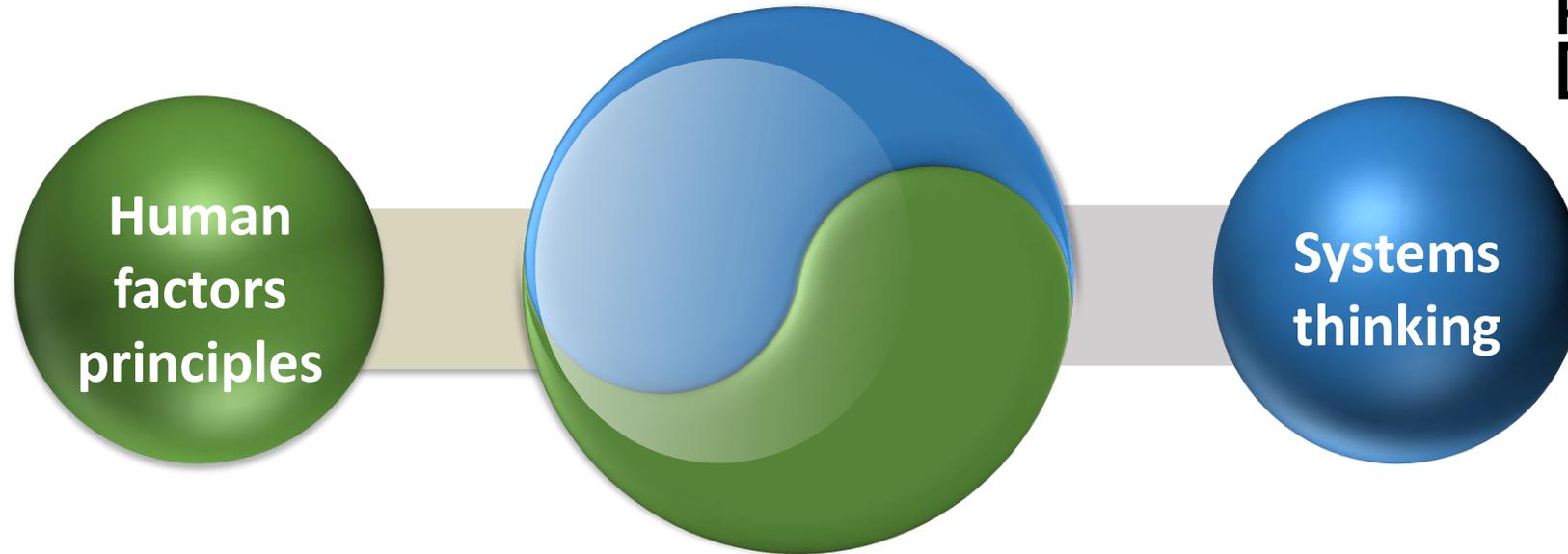
<https://www.aomrc.org.uk/patientsafety/>



This is

- the first NHS-wide patient safety syllabus
- a multi-professional syllabus
- covers all the patient safety training and educational needs of people currently working in the NHS or in training to work in the NHS. This includes both clinical and non-clinical staff and covers the voluntary sector and social care
- The syllabus is based on a systems approach to human factors. It is holistic in its use of human factors, both system- and person-based

# To illustrate the application of human factors principles and systems thinking to incident investigation



One ABOi case has been reworked using SHOT HFIT (by SHOT HF WEG) and SEIPS (collaborative work with NHSEI team)

## Safety-II

**Focus of Safety-II:  
everyday actions and outcomes, risks as well as opportunities**

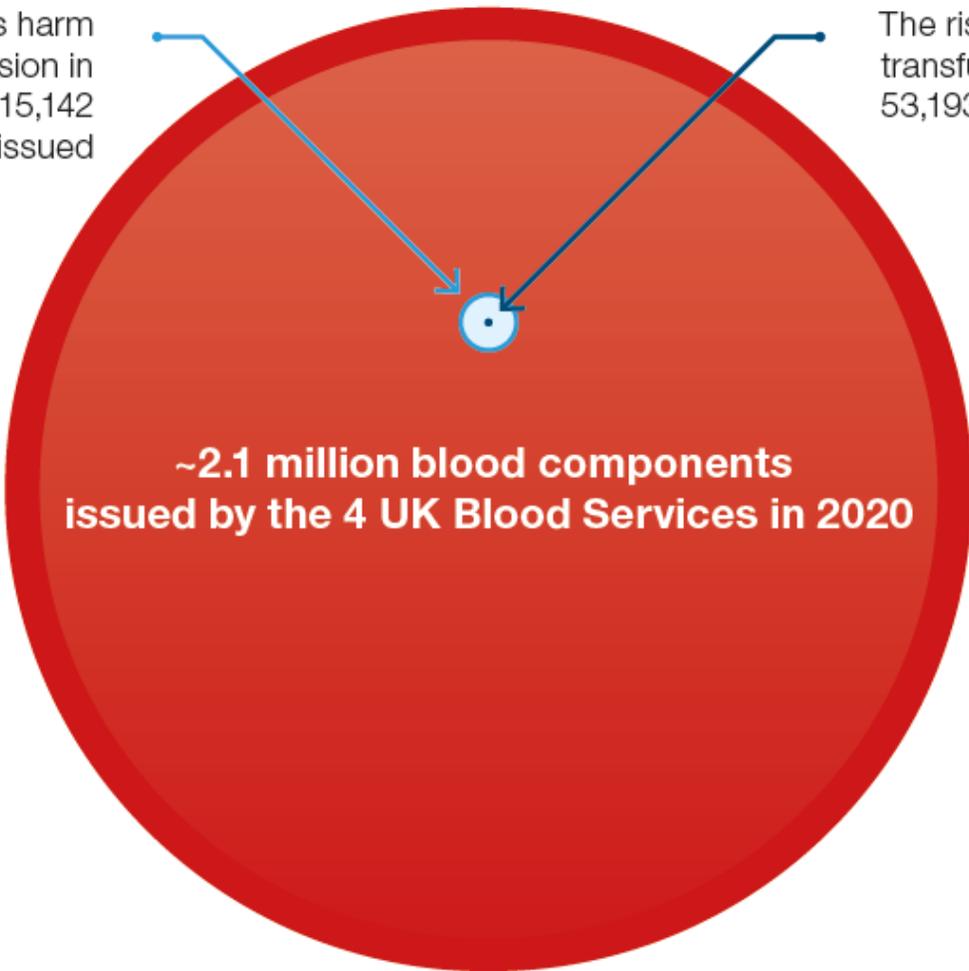
**Focus of  
Safety-I:  
incidents  
accidents  
& disasters**



*This figure is from James Christie's Blog, adapted from the Safety-I and Safety-II diagrams from the document 'From Safety-I to Safety-II: A White Paper (EUROCONTROL, 2013) and 'A White Paper on Resilience Engineering for ATM (EUROCONTROL, 2009)*

The risk of serious harm related to transfusion in the UK is 1 in 15,142 components issued

The risk of death related to transfusion in the UK is 1 in 53,193 components issued



*Note: This is a representative image and not accurate to scale*

# Safer systems

Reactive 01

Proactive 02

Predictive 03

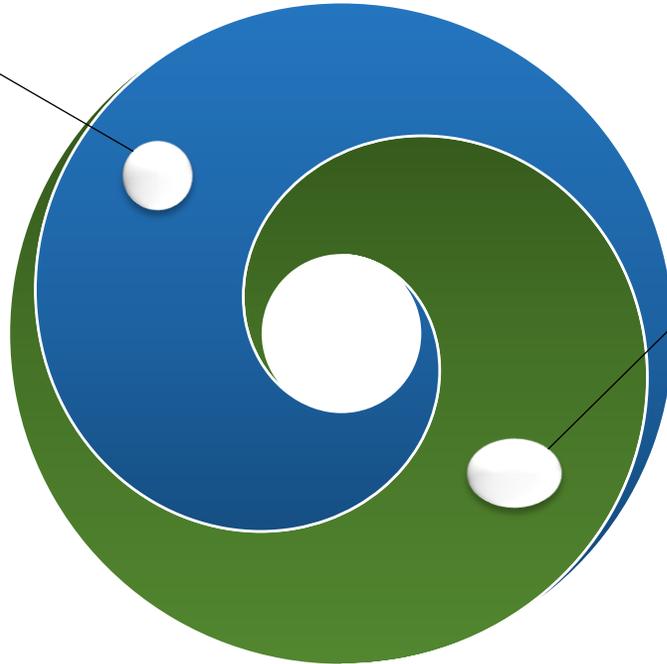
**Combination  
of all these strategies**



# Safety concepts

## Safety-I

- As few things as possible go wrong
- Respond when something happens or is categorised as unacceptable risk
- Humans seen as liability or hazard
- Identify causes and contributory factors



## Safety-II

- As many things as possible go right
- Continuously trying to anticipate developments and events
- Humans seen as resource for system flexibility and resilience
- Understand how things go right to explain how occasionally things go wrong

# SHOT Acknowledging Continuing Excellence in Transfusion

- Learning from all events and experiences including excellence
- Appreciative enquiry
- Making visible the hidden work people do to successfully navigate problems
- Build resilient teams and systems



**SHOT  
ACE**

# Example ACE

Full power outage in UK hospital

Disconnected analysers

Blood component storage devices failed

Computer systems down

No telephone system

# Outcome

- National safety notice
- Shared learning across the UK
- Review of contingency plans



**SHOT** Serious Hazards of Transfusion

**SHOT Safety Notice 01: Emergency preparedness in the transfusion laboratory in case of total power outage**

Dear colleagues,

The SHOT team would like to take this opportunity to share learning and highlight the importance of emergency preparedness. This notice has been issued to share learning following an incident reported to SHOT in 2020 exposing the fragility of our services, which increasingly depend on electrical and electronic equipment. The staff members who faced this situation coped well in challenging circumstances, with no adverse patient outcomes. We would like to commend their actions; help identify potential risks and highlight areas where insights and enhancements can be gained.

# To improve patient safety...

More work needs to be done to improve incident investigations

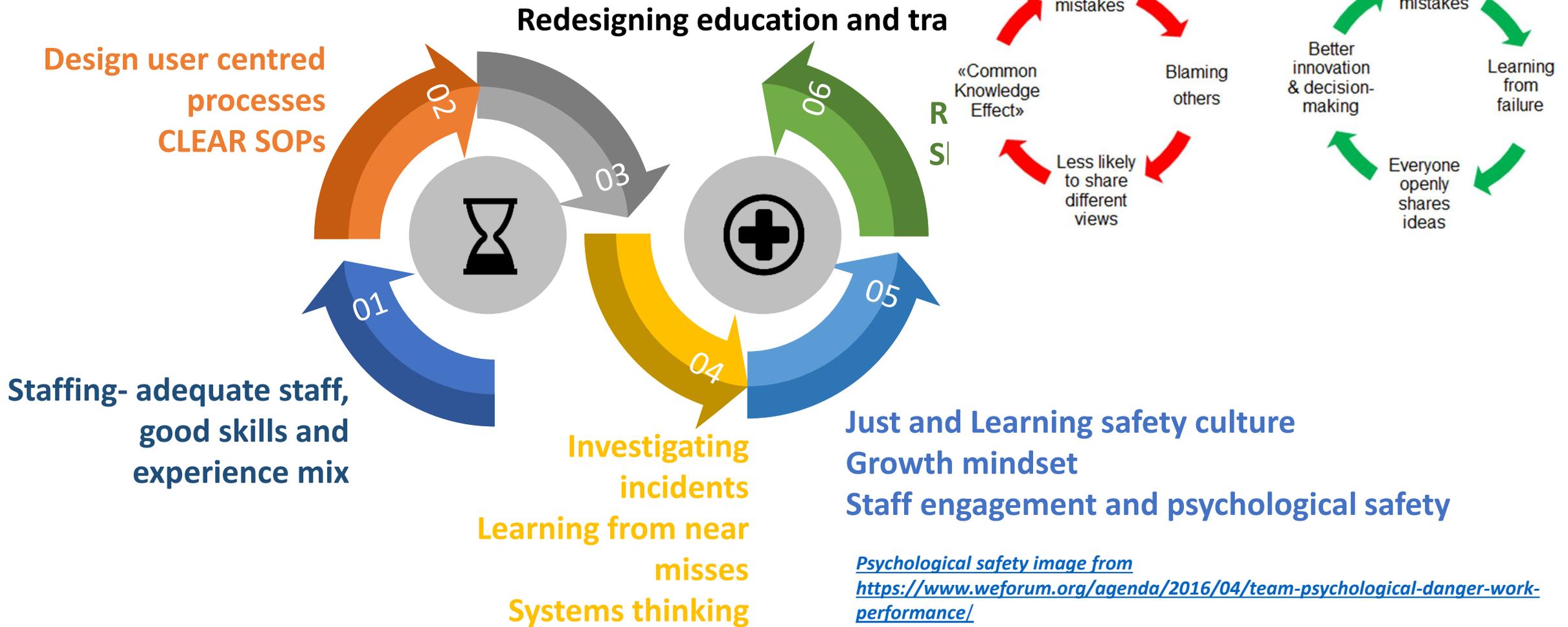
Learning from Near Misses and from excellence

We need to optimise learning from experiences

Incorporate and embed human factors principles and systems thinking

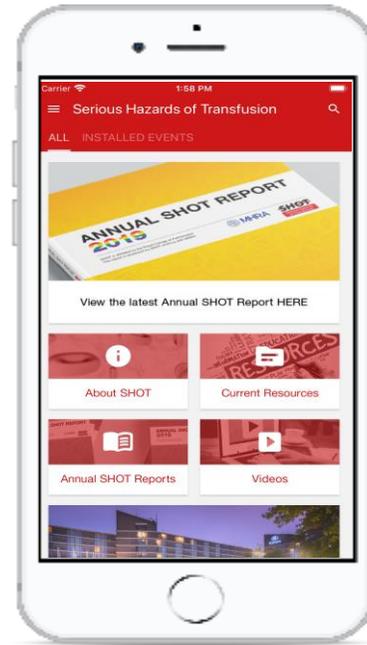


# Moving forward...



# Resources

## SHOT App



# Acknowledgements

- The SHOT Steering Group and Working Expert Group members
- 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](http://www.shotuk.org)



TODAY'S GOOD IDEA IS...



TOMORROW'S SAFER PRACTICE



Special thanks to:

- Dr Alison Watt, SHOT HF expert
- Dr Paula Bolton-Maggs, Past SHOT Medical Director and SHOT SG/WEG member

