BHNOG
Grŵp Goruchwylio Iechyd Gwaed Cenedlaethol
Blood Health National Oversight Group

GIG CYMRU NHS WALES

Transfusion Safety

A Human Factors Toolkit

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Blood Health National Oversight Group

Introduction

This toolkit has been developed by the Blood Health National Oversight (BHNOG) Human Factors Working Group (HFWG). This group is responsible for developing materials & resources aimed at facilitating a human factors approach to transfusion across local Health Boards (HBs) & the blood transfusion service in Wales.

The HFWG has worked with SHOT over the past year to develop packages & resources which aim to assist clinical & laboratory staff in recognising & identifying human factors as contributory factors in transfusion incident investigation.

The toolkit is designed to bring together these & other useful resources. It will be available at the point of need to support & guide staff in their understanding of how they can incorporate this approach when investigating incidents. It can also be used as a training tool for both clinical & laboratory staff if required.

This toolkit is aimed to be used as an interactive guide highlighting many of the key areas where incidents in transfusion are of most concern & offering guidance on ways to investigate & manage these incidents using a human factors approach.

Click on the links at the bottom of the page to navigate to areas of this guide that you require or alternatively browse the full content:

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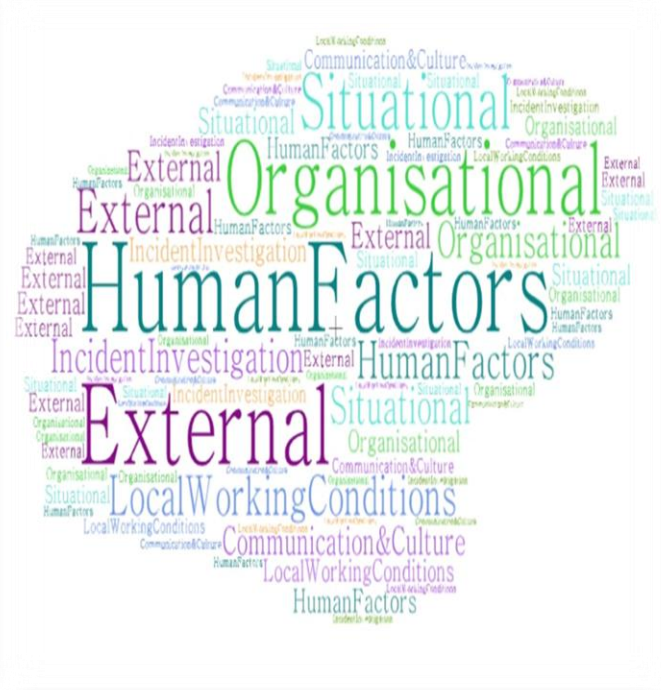
Focusing on Human Factors

What is Human Factors?

"**Human Factors** (also called **ergonomics**) is a discipline that considers **both the physical and mental characteristics of people** as well as **the organisational** factors or wider socio-technical system"[1].

To put into context Human Factors are organisational, individual, environmental, and job characteristics that influence behaviour in ways that can impact safety and in clinical and healthcare settings that means lives are at stake."[1]

To learn more about human factors in healthcare please click here



Focusing on Human Factors

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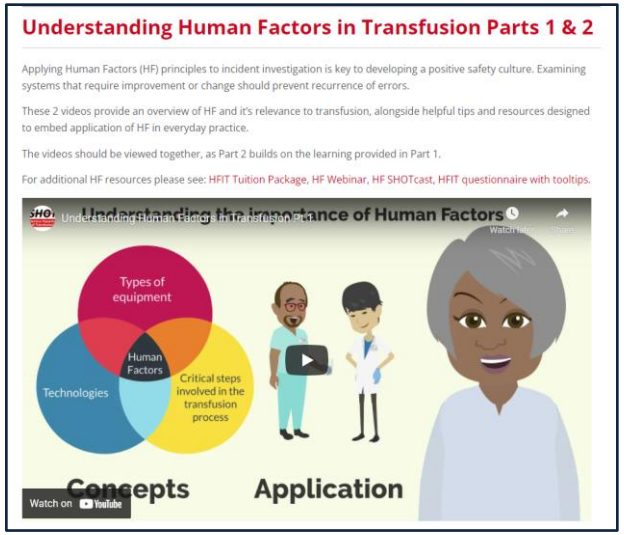
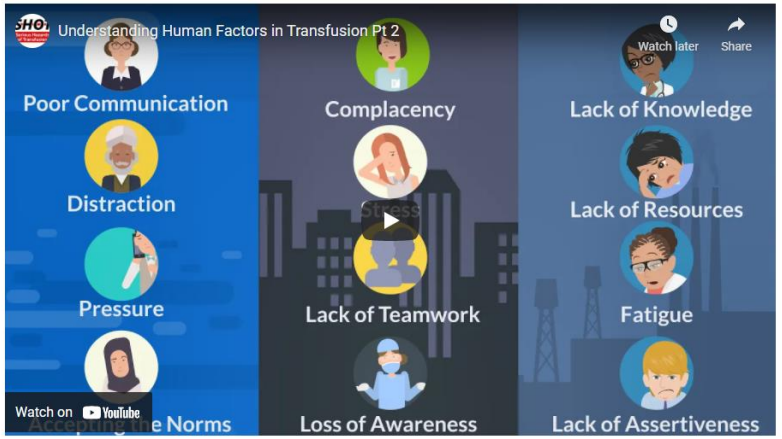
Effective incident investigation is essential in transfusion to prevent patient safety errors which can have potentially fatal consequences. In recent years the Serious Hazard of Transfusion (SHOT) has undertaken much work studying transfusion related errors/incidents & have placed great emphasis on the need to take a human factors approach when investigating these.

For a further explanation of human factors in transfusion as outlined by SHOT please click the images below[2]:





Alternative video format:
Understanding Human Factors in Transfusion Pt 2 (Vimeo)

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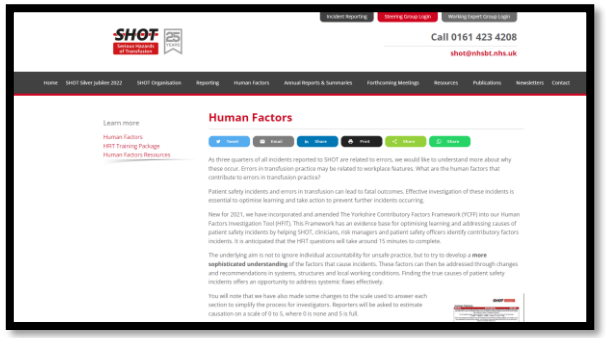
Focusing on Human Factors

"Human factors education & training could help to increase awareness of human vulnerability to error, particularly in the medical setting where there are many risk factors"[2]

In 2021, the BHNOG HFWG worked with SHOT to produce a training package for staff based in transfusion roles in Wales. This presentation considered human factors from a transfusion safety perspective. You can view the presentation here



SHOT has also produced a human factors resource & information page on their website specifically aimed at transfusion staff. Click the image to the left to view the SHOT Human Factors webpage.

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Focusing on Human Factors

SHOT Human Factors Investigation Tool

In 2021 SHOT produced a Human Factors Investigation Tool (HFIT) which was based on The Yorkshire Contributory Factors Framework (YCFF). The framework provided an evidence base for optimising learning & addressing causes of patient safety incidents which it does by assisting SHOT, clinicians, risk managers & patient safety officers to identify contributory factors of incidents using a human factors approach.

SHOT and the BHNOG HFWG also provided staff in Wales with training on how to effectively investigate incidents using the HFIT tool. To view this recorded session click **here**

SHOT also provide a tuition package with further advice on investigating incidents using the HFIT tool, to view this click **here**

Transfusion Errors

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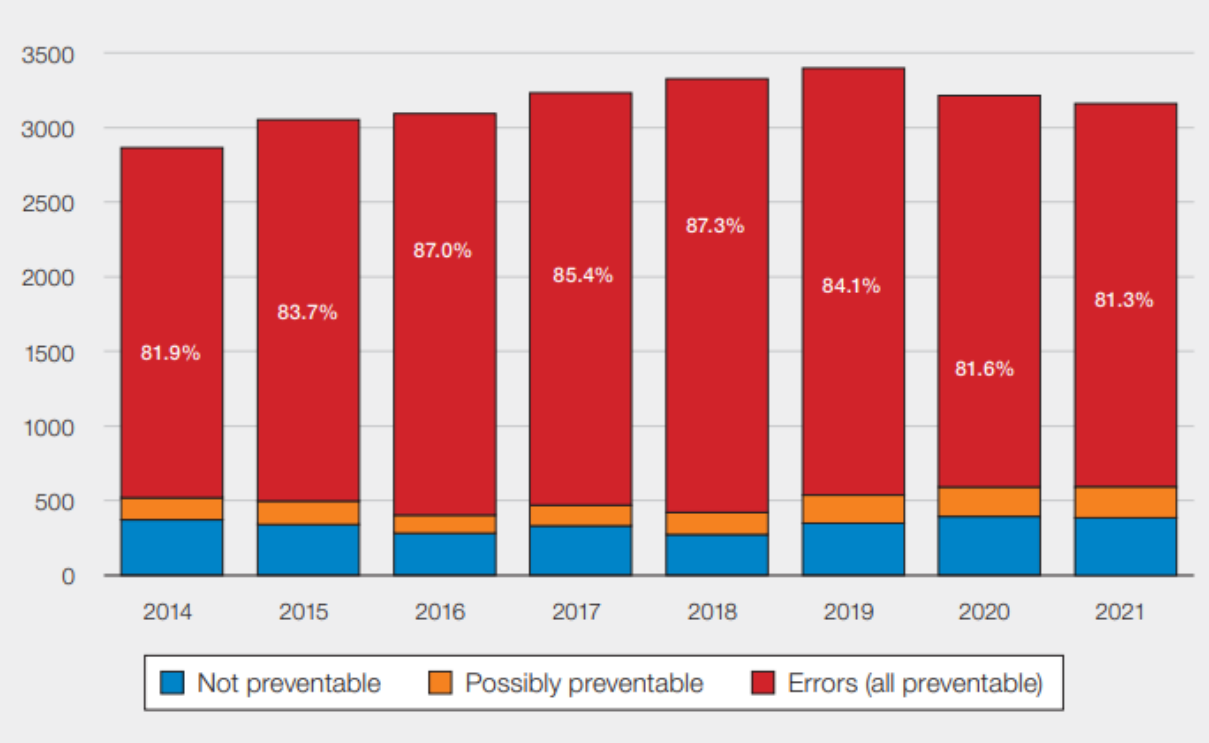

- The figure opposite shows the trends in transfusion errors reported to SHOT as a percentage of total reports 2014- 2021[3]
- Preventable errors continue to contribute to more than 80% of submitted reports, with similar errors reported year on year. Thereby suggesting that there may be issues with the investigation processes & subsequent learning opportunities from such errors
- It is essential that there is a full investigation undertaken of errors to maximise learning & SHOT has recommended this should be carried out using a Human Factors approach

In this section, the toolkit will focus on key areas of concern as identified by SHOT[3] & illustrate how taking a human factors approach can address these

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Transfusion Errors
Wrong Blood in Tube (WBIT)

A 'wrong blood in tube' (WBIT) occurs at the pre-transfusion sample stage when:

- blood is taken from the wrong patient & is labelled with the intended patient's details
- blood is taken from the intended patient, but labelled with another patient's details[3]

SHOT have identified two main causes of WBITs:

1. Failure to identify the patient correctly
2. Labelling the blood sample away from the patient

Infrequently WBITs will evade all detection & so have the potential to result in the patient receiving a blood transfusion that is incompatible (due to being matched against a wrong sample) or does not meet specific transfusion requirements.

These errors remain of concern to SHOT & continue to rise year on year making 77.8% of all near miss errors reported to SHOT in the recent SHOT Report [3]. SHOT have produced a resource which explains the reasons for WBITs in more detail, you can find the link here

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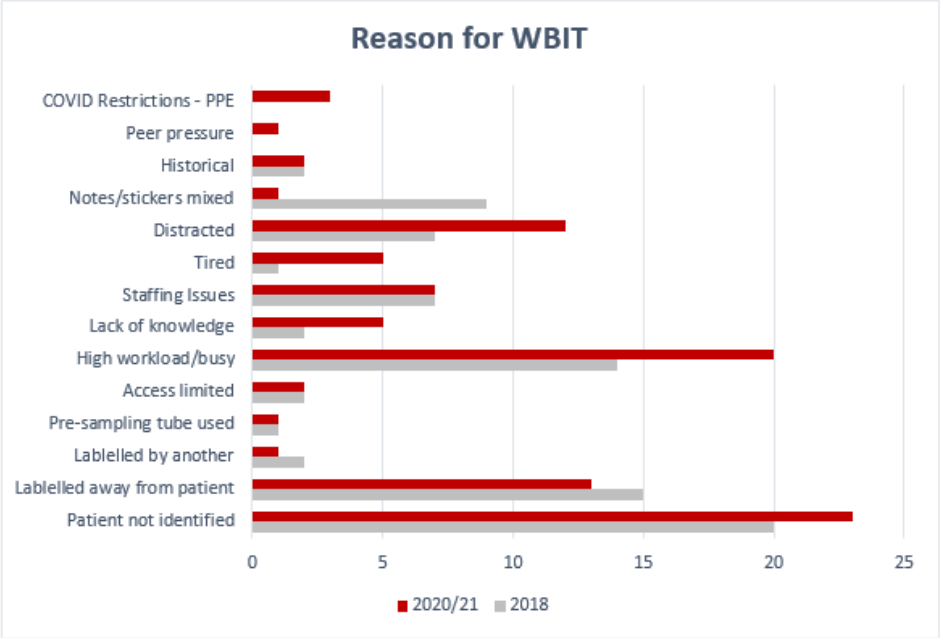
Transfusion Errors
Wrong Blood in Tube (WBIT)

In Wales local clinical audit has been undertaken on WBITs across the local Health Boards (HBs) in both 2018[4] & more recently in 2020[5]. This survey informs us of the reasons behind WBITs & will inform any recommendations. Therefore it is critical that incidents are investigated appropriately. To view the most recent survey please click **here**

The graph to the right indicates the common reasons given for WBITs following incident investigation & gives a comparison between the two audits. The main reasons highlighted are:

1. Patient not being identified on sample taking
2. Sample labelled away from the patient
3. High workload/busy environment
4. Sample taker being distracted



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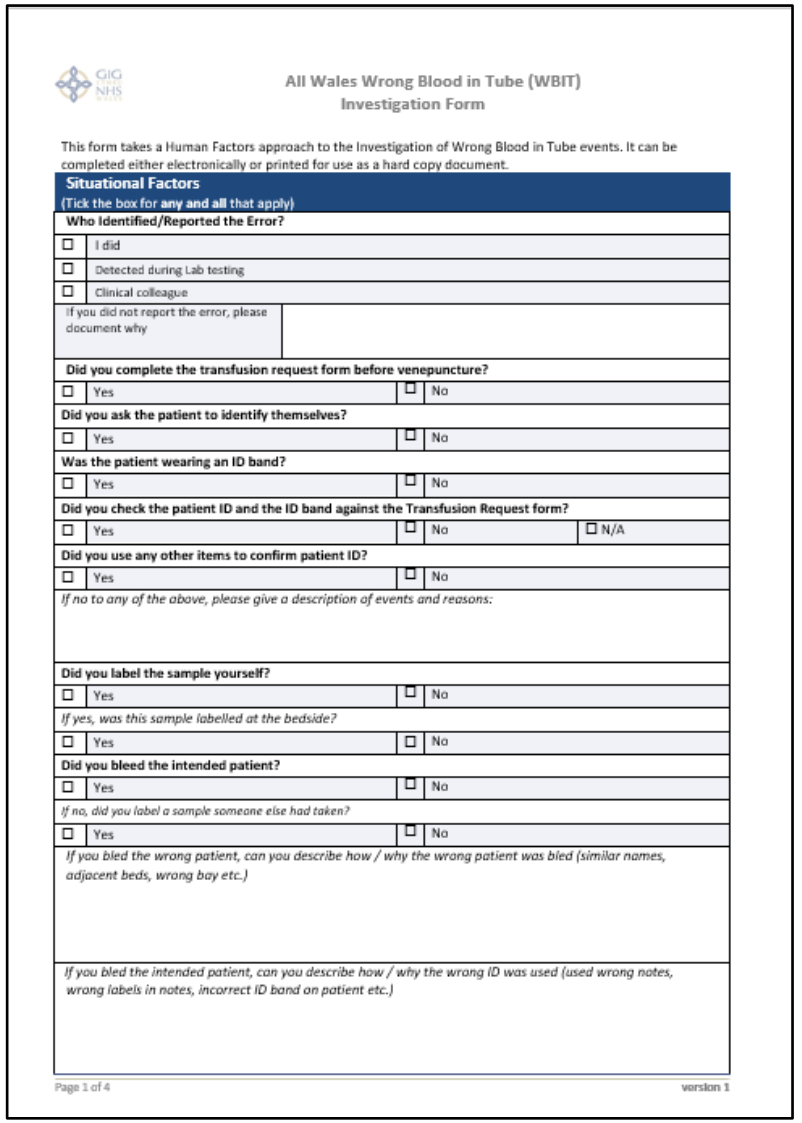
Transfusion Errors
Wrong Blood in Tube (WBIT)

Most Serious Adverse Event (SAE) reports to the Serious Adverse & Blood Reaction Events (SABRE) online system of reporting of blood incidents, initially lack depth & attribute the root cause to human error without first addressing system errors & human factors[3].

In order to assist with this issue & help investigators classify & explore reasons for WBIT incidents, the BHNOG HFWG devised a standardised form for Wales. This form supports a human factors approach, provides consistency in reporting & allows for a more thorough investigation. It is based on the SHOT HFIT tool categories which will also assist in reporting these events into SABRE.

To view & download a copy of the form click here



All Wales Wrong Blood in Tube (WBIT)
Investigation Form

This form takes a Human Factors approach to the Investigation of Wrong Blood in Tube events. It can be completed either electronically or printed for use as a hard copy document.

Situational Factors
(Tick the box for **any and all** that apply)

Who Identified/Reported the Error?

☐ I did
☐ Detected during Lab testing
☐ Clinical colleague
If you did not report the error, please document why

Did you complete the transfusion request form before venepuncture?
☐ Yes ☐ No

Did you ask the patient to identify themselves?
☐ Yes ☐ No

Was the patient wearing an ID band?
☐ Yes ☐ No

Did you check the patient ID and the ID band against the Transfusion Request form?
☐ Yes ☐ No ☐ N/A

Did you use any other items to confirm patient ID?
☐ Yes ☐ No

If no to any of the above, please give a description of events and reasons:

Did you label the sample yourself?
☐ Yes ☐ No

If yes, was this sample labelled at the bedside?
☐ Yes ☐ No

Did you bleed the intended patient?
☐ Yes ☐ No

If no, did you label a sample someone else had taken?
☐ Yes ☐ No

If you bled the wrong patient, can you describe how / why the wrong patient was bled (similar names, adjacent beds, wrong bay etc.)

If you bled the intended patient, can you describe how / why the wrong ID was used (used wrong notes, wrong labels in notes, incorrect ID band on patient etc.)

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Transfusion Errors
Transfusion-Associated Circulatory Overload (TACO)

TACO is defined as:

'**acute** or **worsening** respiratory compromise &/or acute or worsening pulmonary oedema during or up to 12 hours of transfusion, with additional features including cardiovascular system changes not explained by the patient's underlying medical condition; evidence of fluid overload & a relevant biomarker'[3]

TACO is the most commonly reported cause of transfusion-related mortality & major morbidity within transfusion[3]

It is vital that blood component authorisers assess every patient before transfusion for the risks of TACO to minimise its occurrence. This should be done using the TACO pre transfusion checklist (see image opposite) designed by SHOT (click for TACO checklist).

Figure 18b.1: TACO pre-transfusion checklist

TACO Checklist	Patient Risk Assessment	YES	NO
	Does the patient have any of the following: 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?		
	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 receiving intravenous fluids (or received them in the previous 24 hours)?		
	Is there any peripheral oedema?		
	Does the patient have hypoalbuminaemia?		
	Does the patient have significant renal impairment?		

If Risks Identified	YES	NO
Review the need for transfusion (do the benefits outweigh the risks)?		
Can the transfusion be safely deferred until the issue is investigated, treated or resolved?		

If Proceeding with Transfusion: Assign Actions	TICK
Body weight dosing for red cells	
Transfuse a single unit (red cells) and review symptoms	
Measure fluid balance	
Prophylactic diuretic prescribed	
Monitor vital signs closely, including oxygen saturation	

Name (PRINT):	
Role:	
Date:	Time (24hr):
Signature:	

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

To view the SHOT TACO video please click image above

The SHOT TACO checklist can be found in the QR code opposite

TACO CHECKLIST

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Transfusion Errors
Transfusion-Associated Circulatory Overload (TACO)

In the reported cases of TACO to SHOT, the TACO checklist was only used in 30% of these. Therefore identifying that it is not well utilised in practice. Whilst there is no guarantee the use of a TACO checklist would have avoided all cases it could have aided towards the decision making process & allowed for mitigating actions (see image opposite)[3]

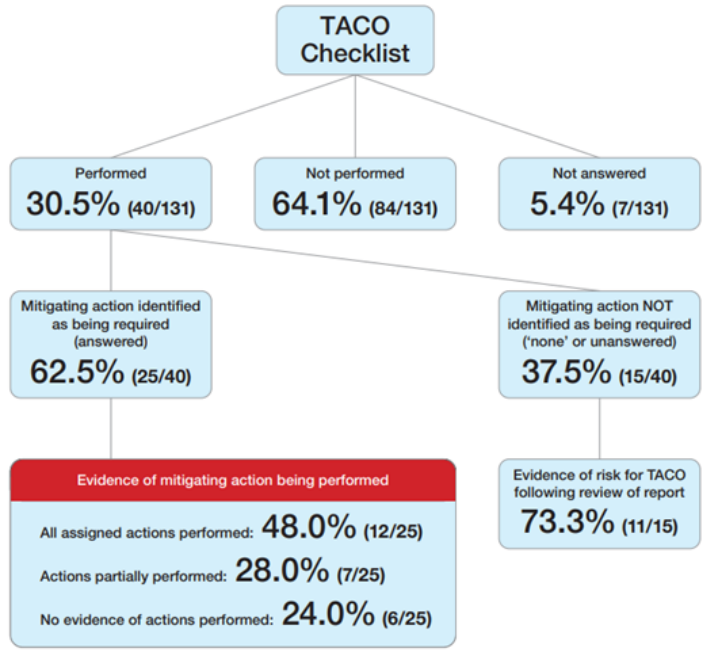
In Wales we are redesigning our transfusion documentation, adding the TACO checklist and a QR code, to prompt clinical staff to undertake the TACO risk assessment prior to transfusion. The QR code is being added to allow clinicians to access this information at point of need. These are examples of using a people centred approach to improving patient safety via considerations of human factors.

Information regarding TACO is also available on the NHS Blood Assist app (see QR code opposite)

TACO incidents are required to be reported to **SABRE** & **SHOT**

Blood assist app

Figure 17a.3: Use of the checklist to identify patients at risk of TACO and implementation of mitigating actions

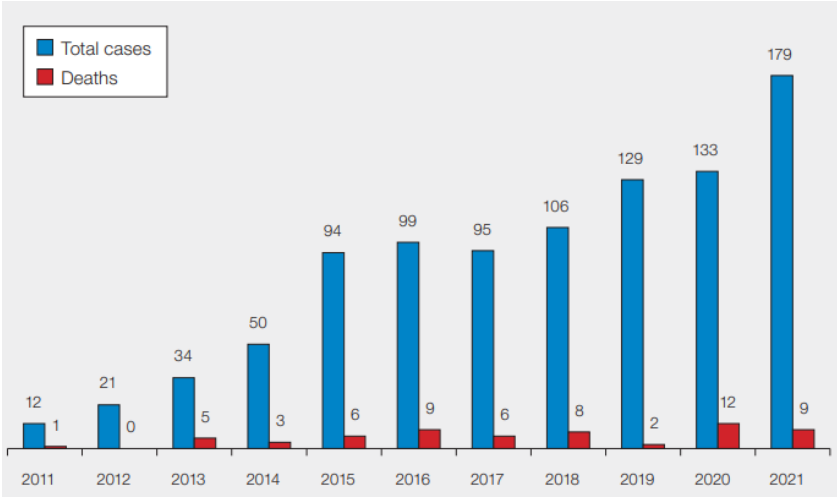


Transfusion Errors
Transfusion Delays

A delayed transfusion is defined as

> ‘Where a transfusion of a blood or blood component was clinically indicated but was not undertaken or was significantly delayed or non-availability of blood components led to a delay with impact on patient care (not restricted to emergency transfusion)[3]

The image opposite shows a year by year trend on total cases of reported delayed transfusions over a 10 year period with 54 deaths[3].



These are preventable errors, which makes the need to investigate them fully all the more paramount as patients are unnecessarily dying as a result.

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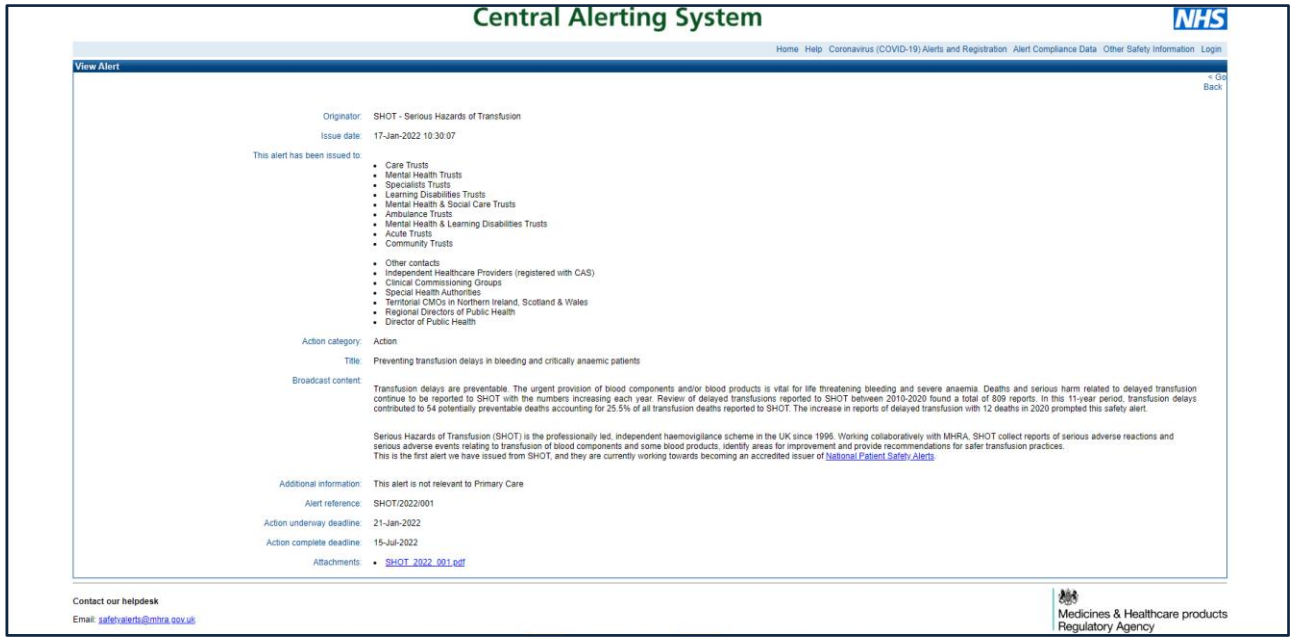
Transfusion Errors
Transfusion Delays

Reasons for delays include:

- Lack of communication
- Sample labelling errors
- Safety check errors
- Poor training
- Staffing issues in both labs & clinical areas
- Issues with MHP activation
- Not following protocols

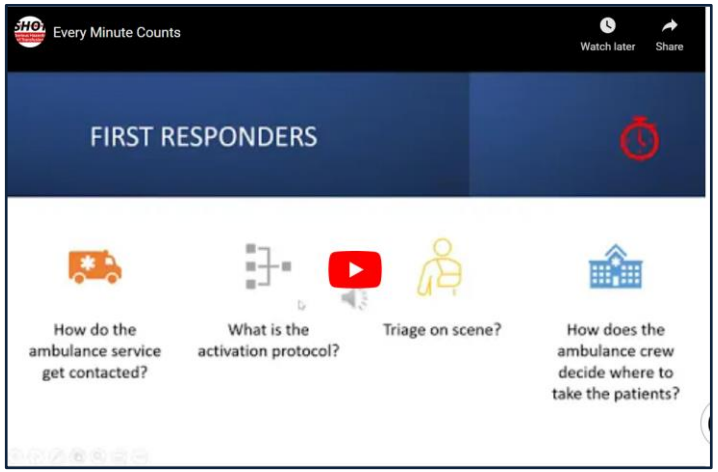


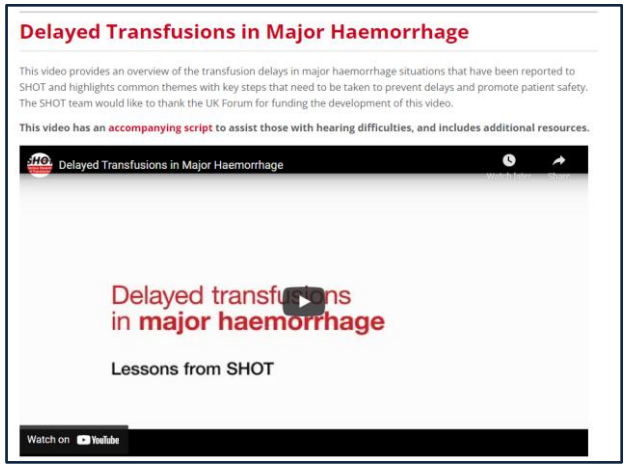
In order to address the continued concern regarding delayed transfusion SHOT issued a CAS alert (January 2022).
To view the CAS alert click on the image above.

Transfusion Errors
Transfusion Delays

Click the images below to access videos which discuss delayed transfusion, their impact & strategies for prevention in Major Haemorrhage situations.

It is vitally important that all delayed transfusions are investigated thoroughly for root cause to be established & learning to occur. It is suggested that the HFIT tool is utilised wherever possible when investigating such incidents (see Focusing on Human Factors section for link).





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Transfusion Errors

Incorrect Blood Component Transfused (IBCT)/ABO incompatible (ABOi) Transfusion Errors

An IBCT is classed as a never event & should never happen but a small majority of cases do occur each year as highlighted by the SHOT reports that are published.

When investigating errors like this, it is important to look at the whole situation. Generally errors occur when there are multiple failings in the 'system' & are often contributed by external factors such as environmental conditions.

A human factors approach will aid in establishing reasons for the error & potential changes that may be require. Use of make it safe meetings with all parties involved, statements & investigation tools such as the WBIT form developed by the HFWG may be used to aid in identifying causes of IBCT & prevent the same errors occurring.

Most IBCT are attributed to patient identification errors[3]. Click on the image opposite to view a resource video that can be used to train staff in correct Patient identification

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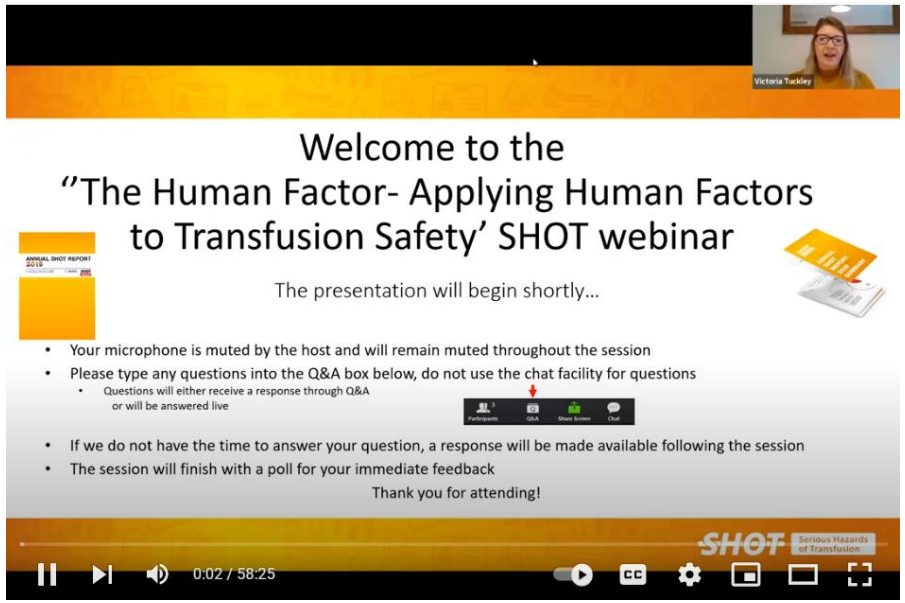
Applying Human Factors in Transfusion

Click on the image below to view the SHOT webinar 'The Human Factor – Applying Human Factors to Transfusion Safety' which gives an overview of Human Factors & the impact on transfusion safety:



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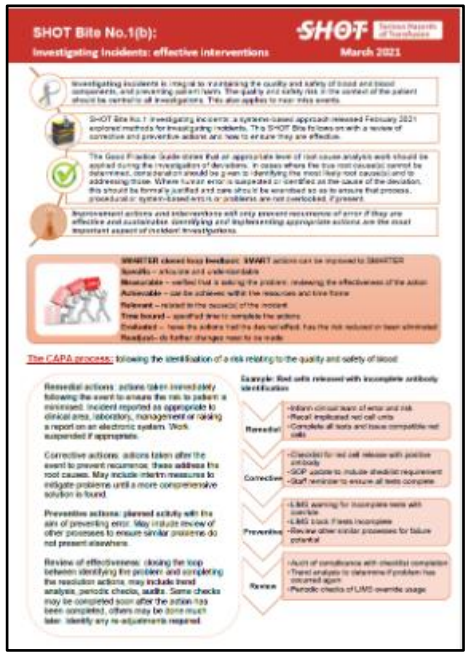
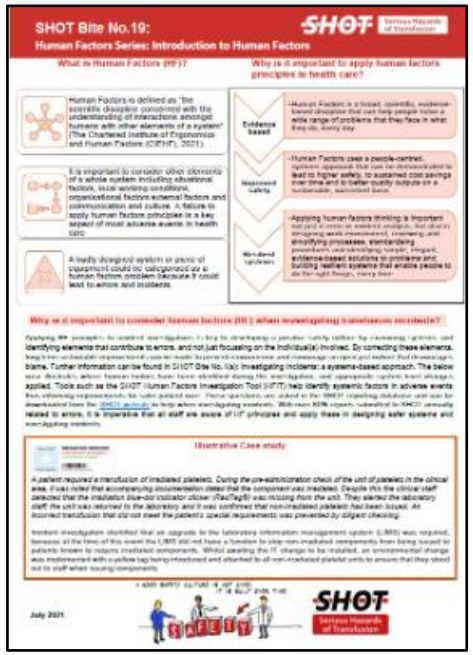
Applying Human Factors in Transfusion
Incident investigation

When investigating an incident, reporters must have taken care to ensure that process, procedural or system-based errors or problems have not been overlooked[2]. Click on each SHOTbite image below to learn more about incident investigation & the role of human factors:





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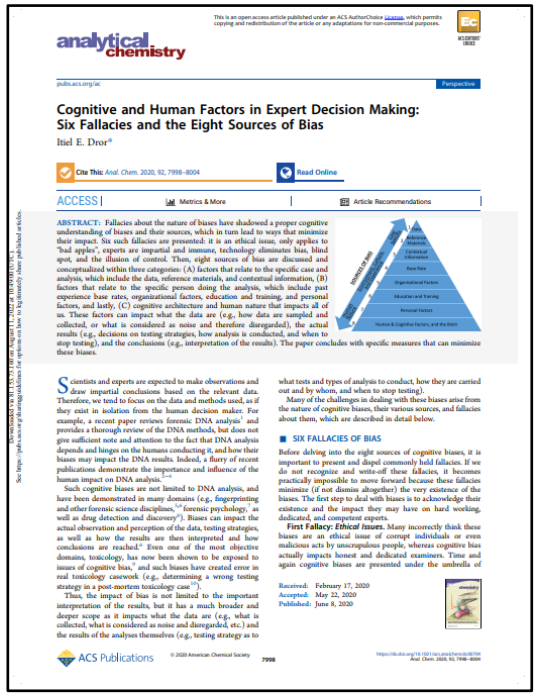
Applying Human Factors in Transfusion
The role of cognitive bias

- Cognitive biases are cognitive short-cuts used to aid our decision-making, & there is increasing recognition that they contribute significantly to errors in healthcare.
- Cognitive biases are flaws or distortions in judgment & decision-making. These are inconsistently reported and therefore challenging to quantify but cognitive biases are increasingly recognised as contributors to patient safety events[6]


analytical chemistry

Cognitive and Human Factors in Expert Decision Making: Six Fallacies and the Eight Sources of Bias

Itiel E. Dror*


SHOT Bite No. 12:

Human Factors Series: An Introduction to Cognitive Biases

SHOT

Serious Hazards of Transfusion

The images above take you to resources aimed to improve your understanding of cognitive biases & the impact they have on errors

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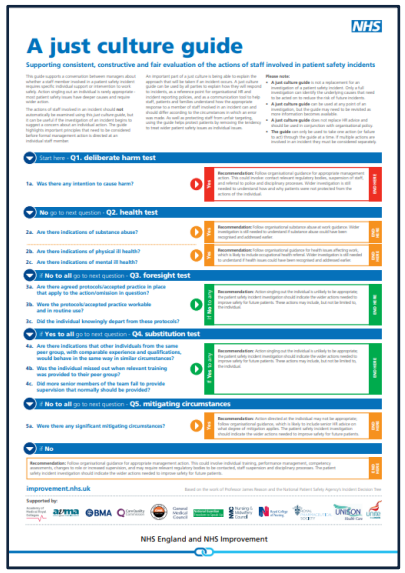
Building a Culture of Transfusion Safety

"Incident investigations must be systematic and thorough, proportionate to the risk and impact and identify systems-based corrective and preventative actions. Fostering a strong and effective safety culture that is 'just and learning' is vital to ensure a reduction in transfusion incidents and errors, and to improve patient safety. The framework of a just culture ensures balanced accountability for both individuals and the organisation responsible for designing and improving systems in the workplace."[3]

For more information about Culture building click on the images below:



Building a Culture of Transfusion Safety

Fair treatment of all employees that generates a **sense of trust**. This trust should facilitate an atmosphere of open safety communication across all levels of the transfusion process.

BALANCE

Individuals believe the organisation demonstrates a goal of **continuous improvement, willingness to learn from events & make improvements.**

CONTINUOUS IMPROVEMENT

TRUST

Individuals feel that they can trust the organisation, their supervisors, co-workers and the investigation process. **Trusting each others commitments to best practice.**

FEEDBACK AND COMMUNICATION

Individuals feel that the organisation does an effective job of **sharing** event information & the outcomes of evaluating events, while **maintain confidentiality** & **respect** for the individuals involved.

OPEN COMMUNICATION

Organisations should facilitate an atmosphere of open safety communication across all levels. It is expected that such an environment will generate an increase in **voluntary error reporting**. Individuals feel willing to share information regarding events and make suggestions for problem solving.

QUALITY OF REPORTING PROCESS

The reporting process **promotes fairness** by using a **transparent** and **reproducible** method for investigating incidents, reducing **fear** and **blame** that can be associated with involvement with adverse events.

Adapted from the JCAT tool[7]

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Building a Culture of Transfusion Safety:
Participation in Haemovigilance

"A continuing high level of participation in haemovigilance reporting is a sign of good reporting culture and reflects that an open and fair culture largely exists in the NHS where staff learn from things that go wrong. Organisations with a culture of high reporting are more likely to have developed proactive reporting and learning to ensure the services they provide are safe. Analysis of submitted data allows identification of risks so that appropriate measures can be initiated to mitigate these risks and improve transfusion safety"[3]

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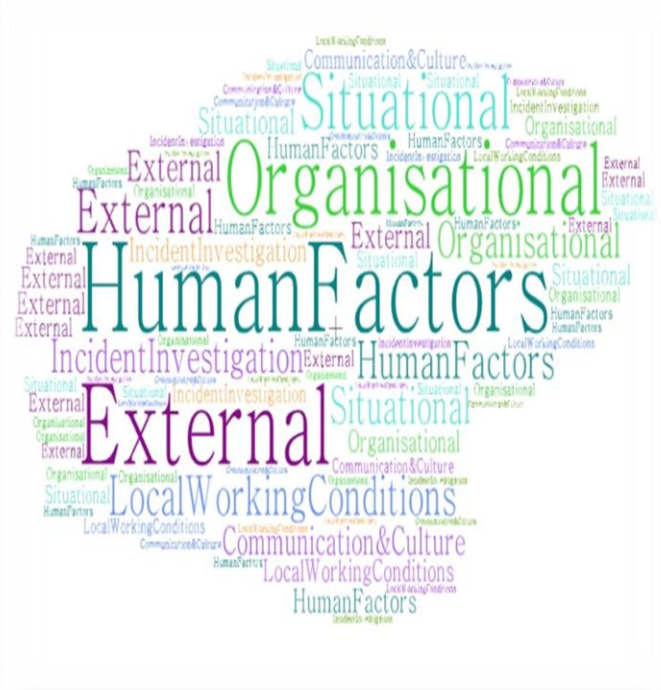
Conclusion

"The principles & practices of Human Factors focus on optimising human performance through better understanding the behaviour of individuals, their interactions with each other & with their environment. By acknowledging human limitations, Human Factors offers ways to minimise & mitigate human frailties, so reducing medical error & its consequences. The system-wide adoption of these concepts offers a unique opportunity to support cultural change & empower the NHS to put patient safety & clinical excellence at its heart."[8]



References

[1]Clinical Human Factors Group (CHFG): what are clinical human factors: https://chfg.org/what-are-clinical-human-factors/

[2]SHOT website: https://www.shotuk.org/

[3]S Narayan (Ed) D Poles et al. on behalf of the Serious Hazards of Transfusion (SHOT) Steering Group. The 2021 Annual SHOT Report (2022)

[4]Blood Health Team (2018) Wales Wide Wrong Blood In Tube Survey

https://wbs-intranet.cymru.nhs.uk/bht/wp-content/bht-uploads/sites/4/2019/04/WBIT-survey-2018.pdf

References

[5]Blood Health Team (2020) All Wales Wrong Blood In Tube Survey: https://wbs-intranet.cymru.nhs.uk/bht/audits-surveys/

[6] SHOT Bites: https://www.shotuk.org/resources/current-resources/shot-bites/

[7]Petschonek S, Burlison J, Cross C, Martin K, Laver J, Landis RS, Hoffman JM. Development of the just culture assessment tool: measuring the perceptions of health-care professionals in hospitals. *J Patient Saf*. 2013 Dec; 9(4):190-7.

[8]Human Factors in Healthcare: A Concordat from the National Quality Board: https://www.england.nhs.uk/wp-content/uploads/2013/11/nqb-hum-fact-concord.pdf

Recommended Resources/websites

- Chartered Institute for Ergonomics and Human Factors: https://ergonomics.org.uk/
- The Health Foundation: http://www.health.org.uk/
- Definitions of current SHOT reporting categories & what to report: https://www.shotuk.org/resources/current-resources/
- SHOT Participation Benchmarking Data: https://www.shotuk.org/reporting/shot-participation-benchmarking/

Contributors

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