Useful tips for the SHOT Human Factors (and Ergonomics) Investigation Tool (HFIT)

SHOT
Serious Hazards of Transfusion

This resource provides information to help understand the causal and contributory factors related to the transfusion events being reported to SHOT from a Human Factors and Ergonomics perspective

For queries contact 0161 423 4208 or
shot@nhsbt.nhs.uk

SHOT recommend watching the educational short videos and completing the transfusion related HFE e-learning module for more information about Human Factors and Ergonomics

This link is to the video section of the SHOT website

Scroll to the section titled: Understanding Human Factors in Transfusion

Part 1 and Part 2 should be viewed together where possible

Human Factors Resources - Serious Hazards of Transfusion

This is the link to the e-learning module

https://learninghub.nhs.uk/catalogue/NHSBT-Learning-Zone

SHOT produced these resources with the NHSBT Digital Learning Team and we would like to also acknowledge valuable contributions from:

All reporting hospitals

SHOT Steering group and Working Expert Group

NHSE for funding support to develop some of these resources

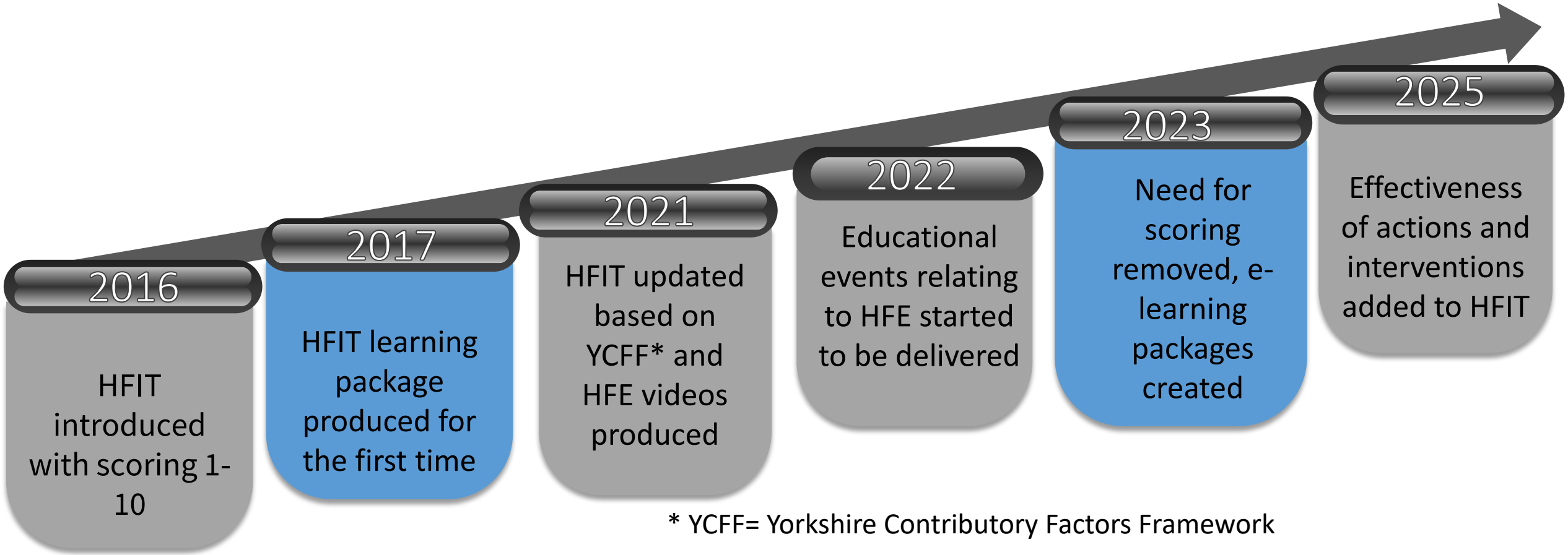
What is Human Factors (HF)?

- The term ‘Human Factors’ relates to how a human interacts with processes, systems, equipment and the environment
- It is equivalent to the term ergonomics and often is known as HFE- Human Factors and Ergonomics
- It should not be mistaken for being only about factors relating to the human themselves
- A badly designed system or piece of equipment could be categorised as human factors because it could lead to errors and incidents
- The following slide has links to further information if you want to know more about human factors

What is the Human Factors Investigation Tool (HFIT)?

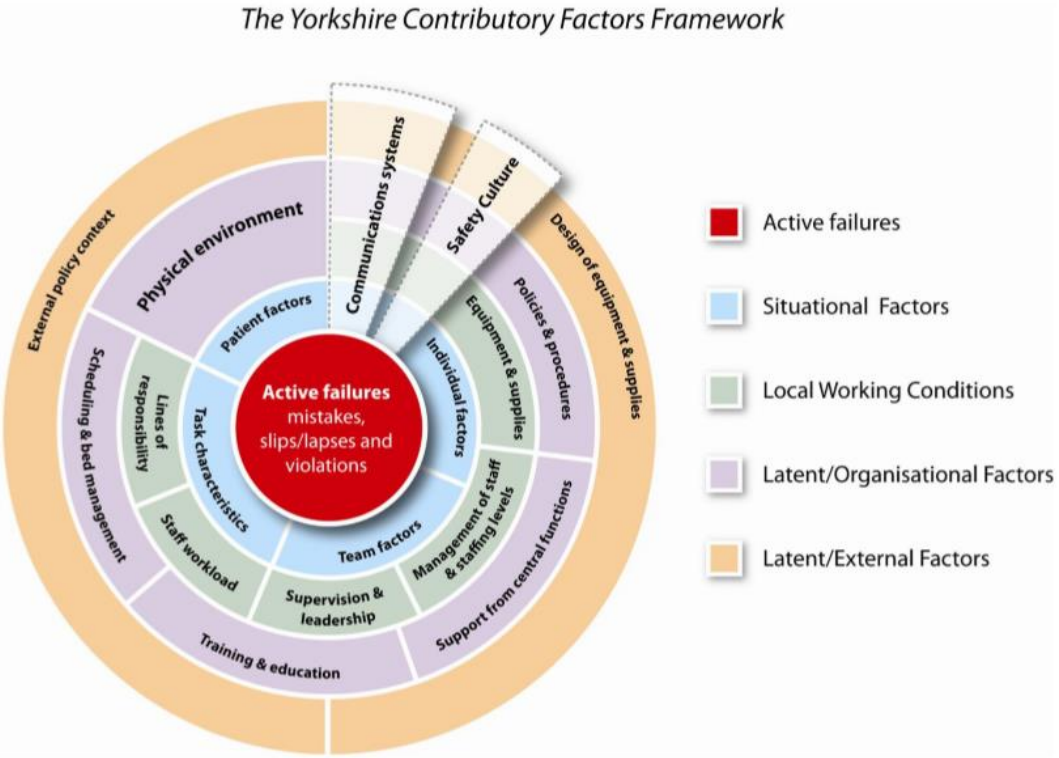
- As three quarters of all incidents reported to SHOT are related to errors, we would like to understand more about why these occur. Errors in transfusion practice may be related to workplace features, communication, and IT systems, and organisational pressures
- The incorporation of the HFIT tool into the SHOT reporting questionnaire allows both reporters and SHOT to understand more about why the error occurred, and what were the contributory factors
- It is important to answer every HFIT question as this will allow SHOT to interpret practices, and alongside reporters, gain understanding of all the factors involved
- SHOT has recognised it can be difficult for reporters to consider the human factors aspects of an incident, so we have prepared this self-learning material
- The HFIT includes questions which cover five main sections. In each of these sections there are subcategories with given examples
- SHOT analyses all HFIT responses for the Annual SHOT Reports and this is used to help inform recommendations
- Reporters will find the HFIT questions at the end of each SHOT error questionnaire

How HFIT has evolved over the years?



* YCFF= Yorkshire Contributory Factors Framework

HFIT updated in 2023 based on the Yorkshire Contributory Factors Framework



YQSR
Yorkshire Quality and Safety Research Group

https://improvementacademy.org/resource/yorkshire-contributory-factors-framework/

What's new for 2025?

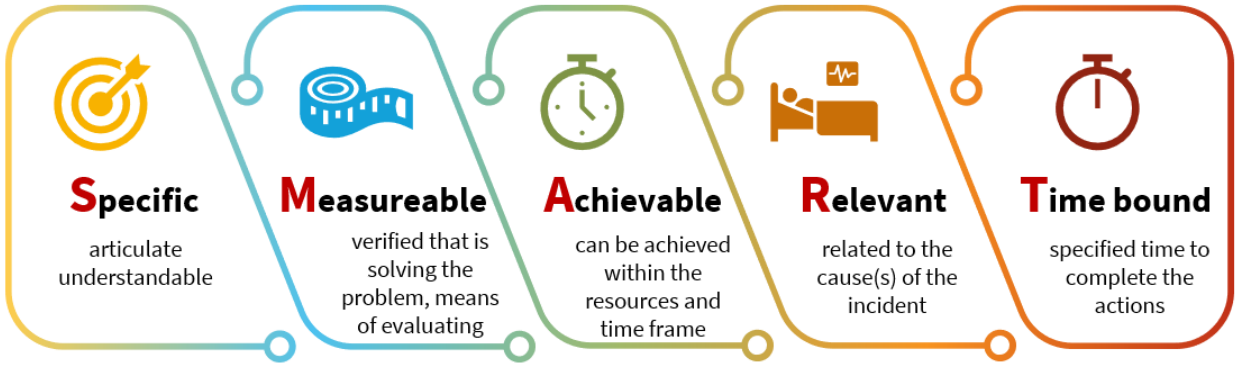
- HFIT, since 2023, incorporates key principles from the Yorkshire Contributory Factors Framework (YCFF). YCFF is the first evidence-based framework of accident causation and helps optimise learning from events. HFIT facilitates identification of causal and contributory factors for patient safety events and promote improvement actions
- From 2025. the wording within the main 5 categories of Communication and Culture, Local Working conditions, Situational Factors, Organisational Factors and External Factors has been updated to a more neutral taxonomy
- Examples for each category have been provided to help reporters to allocate contributory factors
- The updated HFIT also explores effectiveness of actions/interventions
- Identifying all factors causing or contributing to patient safety events offers an opportunity to address systemic flaws effectively, and improve transfusion safety

New for 2025: Actions and Effectiveness

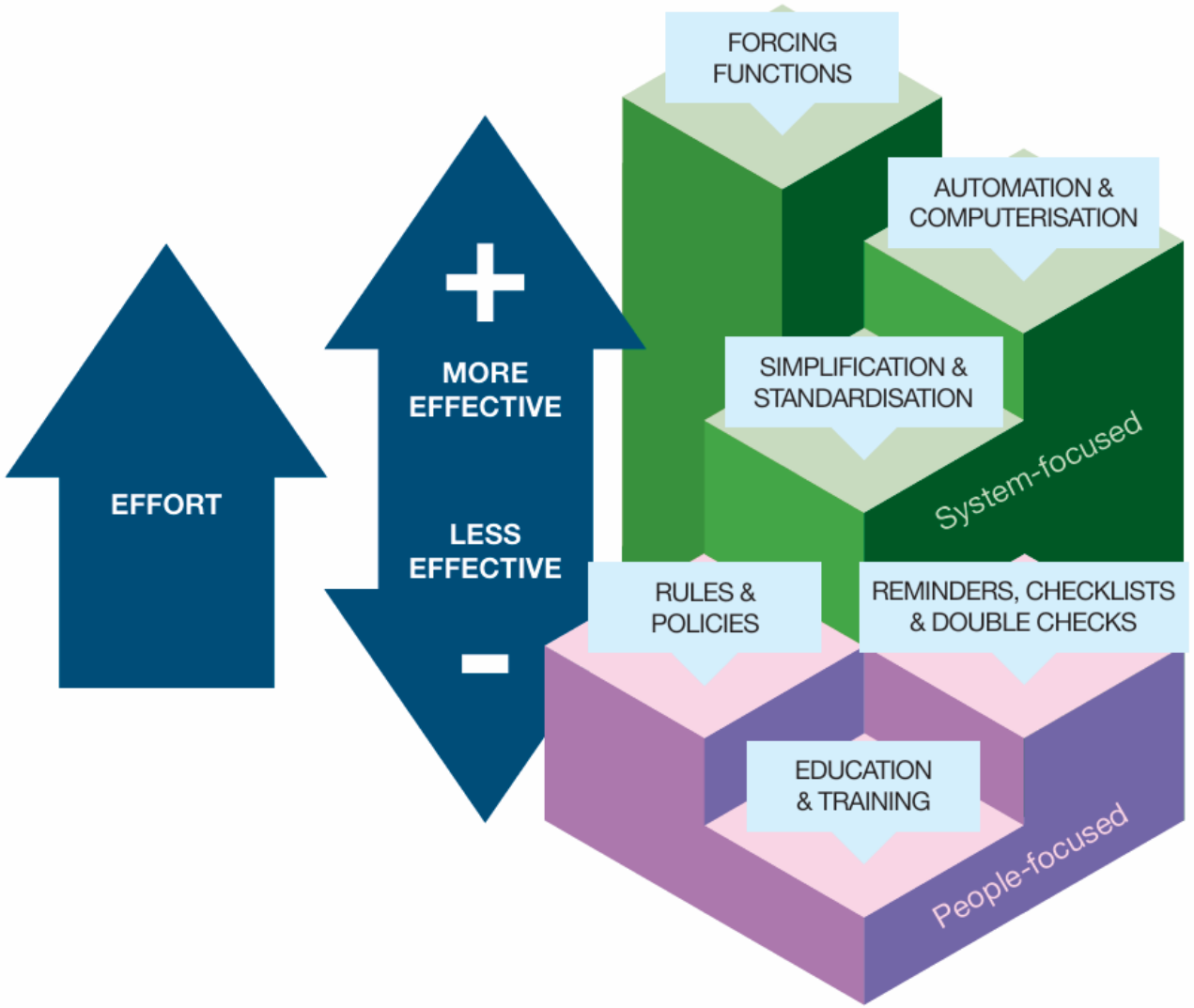
- We have introduced a new “Actions” section for 2025 to capture the type of actions that have been taken after an event, and their effectiveness
- Reporters are asked to add details of up to 3 main actions taken following the event and assess the strength of the intervention using the drop-down options for each action
- These are based on the Hierarchy of Intervention Effectiveness which is further described further on
- The drop-down options are:
    - Forcing Functions e.g. physical change or control to force correct action
    - Automation and computerisation
    - Simplification and standardisation
    - Rules and policies
    - Reminders, checklists and double checks
    - Education and training

Think about **SMART** Corrective and Preventive Actions

- Corrective and preventive actions, or CAPA, will be based on your investigation findings, including all the causes, contributory factors and incidental findings
- There is very rarely a single root cause to be found but multiple factors that added up to an error occurring
- The actions to prevent recurrence need to be **S**MART, **S**pecific, **M**easurable, **A**chievable, **R**elevant, **T**ime bound
- **Vague actions with no tangible outcome, no ownership and no time frame may not happen**
- Don't ignore findings if you think the action to resolve them is going to be too hard or take too long, they still need to be identified and reviewed
- Risks identified should be added to the organisations risk register



Hierarchy of intervention effectiveness



- The hierarchy of intervention effectiveness is a framework for ranking corrective actions by their effectiveness
- It deems person-based approaches, such as the use of checklists, policies, and reflection, as weaker than those targeted at the system level

Here are some examples of action effectiveness:

The red, amber, green colouring demonstrated the hierarchy of effectiveness (green lowest, red highest). These examples are all reasonably good actions in context, we are simply demonstrating the hierarchy here.

• Action	• Effectiveness category
Ensuring the LIMS does not allow issue of ABO incompatible red cell units	Forcing functions, automation and computerisation
Introducing a policy for the collection of blood components in newly built theatres	Rules and policies
Re-writing an SOP that has been amended many times and become confusing	Simplification and standardisation
Incorporating TACO pre-transfusion risk assessment into the transfusion record	Reminders, checklists, double checks
Create training plan and competency assessment covering fridge alerts and deliver training to all staff	Education and training

Completing the Human Factors questions

- As you will recall we made some changes by removing the scale used to answer each section to simplify the process for investigators back in 2023
- For each question, please select yes/no, and state the factors that may have contributed to the event occurring
- There are 5 sections to the questionnaire as seen on the next page
- An additional “new” actions taken section has been added at the end of the question set

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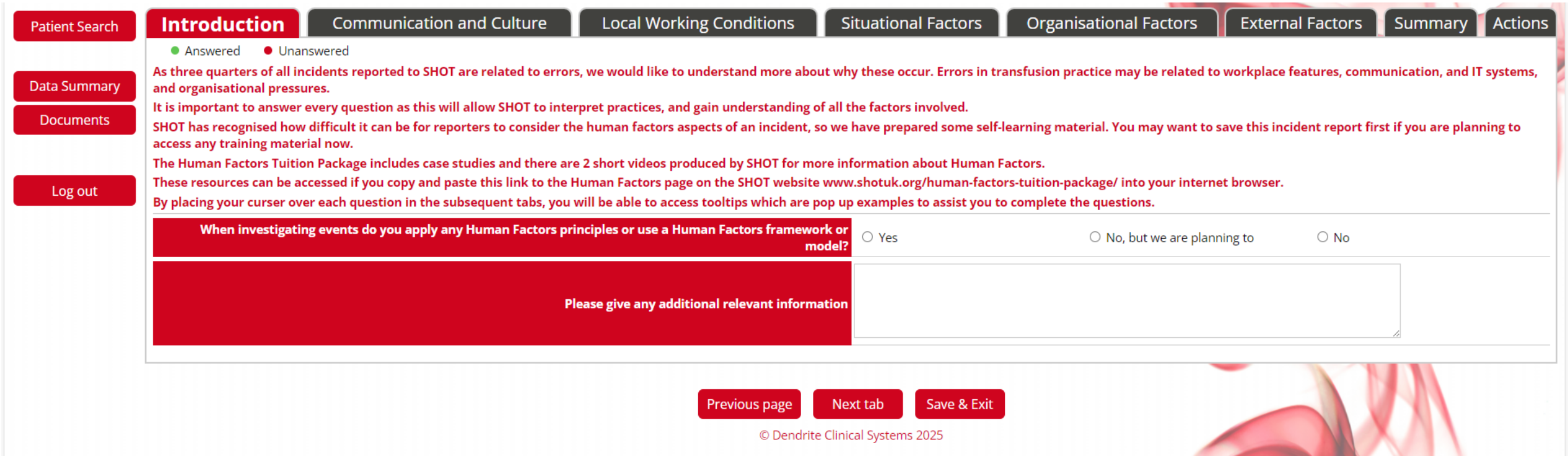
Human Factors page in SHOT Database (Dendrite)



This is a demonstration of the page in the SHOT Database

Don't worry that you can't see the detail in this screenshot

The questions and answer options are clear in Dendrite

SHOT Serious Hazards of Transfusion

Communication and Culture, Local Working Conditions, Situational, Organisational, External

- Reporters may experience challenges when considering the contributory factors, the farther away it gets from the individual and the actual incident, and it is acknowledged these can be difficult to assess
- Discussion points in the following case studies may give ideas for factors to consider that are outside the control of the individual or their local managers. However, such factors may contribute heavily, and actions needed may have to be added to the risk register for review at a senior level
- It may be worth considering if external factors could result in policies and procedures not being followed by staff

How can we assess cases for Human Factors ?

This tuition package on Human Factors is designed to help investigators to answer the SHOT human factors questions.

In particular, it may help investigators to consider the non-staff related factors that can contribute to the cause of an event, such as:

- Communication and Culture
- Local Working Conditions
- Situational Factors
- Organisational Factors
- External Factors

Please note: There are no right or wrong answers! The suggested answers given in cases below are not exhaustive, but are examples based on the information SHOT received. Reporters investigating the case locally may have more information that would lead them to assess the event differently.

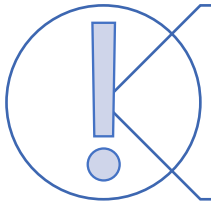
The following case studies are illustrative cases

- The following case studies and the initial consideration of factors given are from cases reported to SHOT using the original human factors investigation tool (HFIT). These have been updated to include worked examples using the 2025 HFIT.
- SHOT is very grateful to reporters for sharing their cases and completing the original HFIT questions
- Reporters are not expected in any way to be human factors experts, so there is no criticism implied by the discussion of scores originally given or factors now suggested in these case studies
- Cases are full anonymised

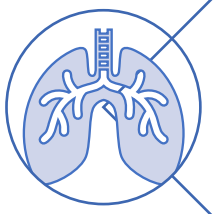
Case study 1 - Total cause of incident initially attributed to individual

A patient was transfused 2 units of red cells with a Hb of 79g/L, despite known risk factors for transfusion-associated circulatory overload (TACO)

According to the protocol only 1 red cell unit should have been administered initially and patient clinically reassessed, but the patient was not monitored between units. A second unit was given, but subsequently deemed to have been transfused unnecessarily.



The nurse administering the transfusion had not recognised the risk and only carried out routine blood transfusion observations



A junior doctor reviewed the patient after the 2nd unit for complaints of shortness of breath. The doctor documented unlikely to be TACO as the patient calmed down during the examination with reassurance and was not in consistent respiratory distress. The case was reviewed by the transfusion consultant and SHOT experts who concluded this was an inappropriate transfusion that resulted in TACO

Case study 1

For this case, total responsibility to the individual staff member was given but no weighting was allocated to the other factors.

Cause attributable to unsafe practice/conditions associated with:
Individual staff member(s) – *total responsibility given to the individual*
The local environment or workspace
Organisational or management issues in the Trust/Health Board
Government, Department of Health or high-level regulatory issues
Communication and culture

Case study 1 - discussion

- To recall, this case was originally given total responsibility for the individual staff member, but information given in the report shows other factors may have been contributory
- The **local environment or workspace** was not ideal, because no pump was available, so the transfusion was given by free flow. The second red cell unit was given too quickly at 1 hour 45 mins instead of 3 hours
- There were also **organisational issues** with shared care and co-morbidities:
  - *The patient was on regular transfusions at a different hospital*
  - *The patient was taken off regular diuretic medication prior to having an investigation, and was on intravenous fluids*
  - *Appears to have been given the blood, because her regular 3-weekly transfusion was due, without taking into account the patients current clinical status*
- A patient with complex transfusion issues was being monitored by a nurse who didn't recognise the TACO risk and was referred to a junior doctor to assess the shortness of breath. If apparently inexperienced staff were involved due to poor staffing levels that could be seen as **external factors**, because of possible under-resourcing of the health service

Case study 1 - HF when further info considered and reworked using HFIT 2025

Section 1-Communication and Culture

Communication and Culture	
Did difficulties with safety culture in your area contribute to this event?	Yes
Did written, or verbal communication issues worsen the situation	Yes
Please give any additional relevant information for communication and culture	The patient was not clinically reassessed or monitored between blood units, suggesting lack of knowledge of transfusion safety There were issues around shared care between hospitals. This was possibly compounded by suboptimal communication and handover

*** The suggested answers assume all discussion points are valid, but the local investigator may know more detail and might answer differently**

Section 2- Local Working conditions

Local Working Conditions	
Were there challenges between workload and staff provision around the time of the event?	No
Were there any challenges or barriers related to team function in relation to leadership, supervision and roles within the team?	Yes
Were there any difficulties obtaining the right equipment and/or supplies at the right time?	Yes
Please give any additional relevant information for local working conditions *** The suggested answers assume all discussion points are valid, but the local investigator may know more detail and might answer differently**	No transfusion pump was available on the ward meaning the transfusion was given by free flow. This resulted in the second unit being given too quickly at 1 hour and 45 minutes instead of 3 hours. As above, the patient was being monitored by a nurse that didn't recognise TACO risk and reviewed by a junior doctor. Delegation to inexperienced and junior staff could have been a factor here

Section 3- Situational Factors

Situational Factors	
Does the cause of this event include any challenges or barriers in team function?	Yes
Were there any reasons this event was more likely to occur with the particular staff involved?	Yes
Did challenges or barriers in task features make the event more likely?	No
Were there reasons that this event was more likely to occur to this particular patient?	Yes
Please give any additional relevant information for situational factors	The patient was being monitored by a nurse that didn't recognise TACO risk and reviewed by a junior doctor. A lack of experience could have been a factor here. The patient had complex transfusion issues and risk of TACO The patient was known Acute Kidney Injury but had been taken off diuretics for investigations

*** The suggested answers assume all discussion points are valid, but the local investigator may know more detail and might answer differently**

Section 4- Organisational Factors

Organisational Factors	
Did the environment hinder work in any way?	No
Were there difficulties in other departments that contributed?	Yes
Did organisational pressures play a role in the event?	Yes
Were there issues or gaps with staff skill or knowledge?	Yes
Were there any issues with policies and procedures?	Yes
Please give any additional relevant information for organisational factors	There were issues around shared care The patient was regularly transfused at a different hospital and had co-morbidities and transfusion needs that may have been poorly communicated or subject to a lack of information and handover between organisations

*** The suggested answers assume all discussion points are valid, but the local investigator may know more detail and might answer differently**

Section 5 – External Factors

External Factors	
Were there any characteristics about the equipment that were unhelpful?	No
Have any national policies or high-level regulatory issues influenced this event?	Yes
Please give any additional relevant information for external factors	If inexperienced staff were involved, and inadequate patient monitoring occurred due to poor staffing levels this could be seen as a Department of Health level issue because of underfunding of the health service

*** The suggested answers assume all discussion points are valid, but the local investigator may know more detail and might answer differently**

Section 6- Summary

Section 6- Summary	
Which of these options do you consider to be the most important contributory factor for this event? (Single choice) Situational Local working Organisational External Communication and culture	Situational
If you could change one thing to make this event less likely to happen again, what would it be?	Improve intrahospital communication Better skill mix Increased knowledge of transfusion risks and recognition of adverse reactions

*** The suggested summary assumes all discussion points are valid, but the local investigator may know more detail and might answer differently**

Section 7- Actions Taken - Illustrative example

Actions Taken	
Brief outline of Action 1	The nurse and junior doctor involved are to undertake repeat transfusion mandatory training and competency assessment
Effectiveness of Action 1 • Forcing Functions e.g. physical change or control to force correct action • Automation and computerisation • Simplification and standardisation • Rules and policies • Reminders, checklists and double checks • Education and training ✓	The action outlined above is not a **SMART** action as there is no tangible outcome, no ownership, time frame or review of effectiveness. It would come under **Education and training** for action effectiveness. This may be seen as a weak action in the **intervention hierarchy** for this particular case. Given that there were contributory factors such as equipment shortages and issues around shared care, simply retraining the individual staff involved would not prevent reoccurrence of a similar event and may be seen as punitive.

*** Please note that this section was not answered in the original report to SHOT. This has been added as an example to illustrate the new section.**

Case study 2: Causes attributed evenly to all factors

A group A D-positive patient received a haemopoietic stem cell transplant (HSCT) from a group A D-negative donor

The transplant protocol was received in the laboratory, but the specific transfusion instructions were not recorded in the laboratory information management system (LIMS)

Post transplant, two units of A D-positive platelets were transfused instead of A D-negative platelets. The lack of transplant information in the LIMS means a new sample may not have been tested before issuing platelets

A later group and save request highlighted the error that the patient's transplant had not been recorded in the LIMS

There was no harm to the patient, and it can be shown of the platelet transfusion the recipient was still grouping as A D-positive, i.e. had not yet converted that at the time to the donor's A D-negative group. D negative components should have been given

Case study 2

Human factors attributed when the case was originally submitted are listed below.

Cause attributable to unsafe practice/conditions associated with:	Yes/no
Individual staff member(s)	Yes
The local environment or workspace	Yes
Organisational or management issues in the Trust/Health Board	Yes
Government, Department of Health or high level regulatory issues	Yes

Case study 2 - discussion

- This case gave a balanced assessment of factors in the original report
- Explanatory comments were given about each section, so their accuracy could be determined
- No suggested changes to the original assessment were considered necessary when the further information was analysed

Case study 2 - HF when further information considered and reworked using updated HFIT

Section 1-Communication and Culture

Communication and Culture	
Did difficulties with safety culture in your area contribute to this event?	No
Did written, or verbal communication issues worsen the situation?	Yes
Please give any additional relevant information for communication and culture	Staff were multitasking

*** The suggested answers assume all discussion points are valid, but the local investigator may know more detail and might answer differently**

Section 2- Local working Conditions

Local Working conditions	
Were there challenges between workload and staff provision around the time of the event?	Yes
Was there any failure of team function in relation to leadership, supervision and roles?	Yes
Were there any difficulties obtaining the right equipment and/or supplies at the right time?	No
Please give any additional relevant information for local working conditions	Staff shortages Implementation of a shift pattern has resulted in fewer qualified staff available during routine hours

- **The suggested answers assume all discussion points are valid, but the local investigator may know more detail and might answer differently**

Section 3- Situational Factors

Situational Factors	
Does the cause of this event include any challenges or barriers in team function?	Yes
Were there any reasons this event was more likely to occur with the particular staff involved?	Yes
Did challenges or barriers in task features make the event more likely?	No
Were there reasons that this event was more likely to occur to this particular patient?	No
Please give any additional relevant information for situational factors	BMS followed procedure but omitted one step Interruptions by colleagues and other healthcare professionals whilst inputting data into the LIMS

*** The suggested answers assume all discussion points are valid, but the local investigator may know more detail and might answer differently**

Section 4- Organisational Factors

Organisational Factors	
Did the environment hinder work in any way?	Yes
Were there difficulties in other departments that contributed?	No
Did organisational pressures play a role in the event?	Yes
Were there issues or gaps with staff skill or knowledge?	Yes
Were there any issues with policies and procedures?	No
Please give any additional relevant information for organisational factors	Interruptions by colleagues and other healthcare professionals whilst inputting data into the LIMS Implementation of a shift pattern has resulted in fewer qualified staff available during routine hours

*** The suggested answers assume all discussion points are valid, but the local investigator may know more detail and might score differently**

Section 5 – External Factors

Section 4- External Factors	
Were there any characteristics about the equipment that were unhelpful?	No
Have any national policies or high-level regulatory issues influenced this event?	Yes
Please give any additional relevant information for external factors	Insufficient NHS funding leading to inability to increase staff levels to cope with increased workloads and changes in work patterns

*** The suggested answers assume all discussion points are valid, but the local investigator may know more detail and might score differently**

Section 6- Summary

Section 6- Summary	
Which of these options do you consider to be the most important contributory factor for this incident? (Single choice) Situational Local working Organisational External Communication and culture	Local working conditions
If you could change one thing to make this incident less likely to happen again, what would it be?	Improved skill mix Create a workspace for BMS free from interruptions

*** The suggested summary assumes all discussion points are valid, but the local investigator may know more detail and might answer differently**

Section 7- Actions Taken – Illustrative example

Actions Taken	
Brief outline of Action 1	Transfusion laboratory manager and pathology manager to review staffing levels and skill mix and undertake a gap analysis within 2 weeks. Findings to be reported at the Hospital Transfusion Committee meeting in 4 weeks. Safe staffing and skill mix policies to be updated within 8 weeks.
Effectiveness of Action 1 • Forcing Functions e.g. physical change or control to force correct action • Automation and computerisation • Simplification and standardisation • Rules and policies ✓ • Reminders, checklists and double checks • Education and training	The action outlined above is **SMART** as there is a proposed outcome, ownership, time frames and reviews of effectiveness. It would come under for **Rules and policies** for action effectiveness. The current policies will be reviewed following an exercise to review current status and analyse gaps and reporting to relevant governance forums.

*** Please note that this section was not answered in the original report to SHOT. This has been added as an example to illustrate the new section.**

Section 7- Actions Taken – Illustrative example

Actions Taken	
Brief outline of Action 2	During critical tasks the door will be closed in the component issue room to create a quite area free from distractions. A do not disturb unless urgent sign will be placed on the door. Action to be completed by the transfusion laboratory manager within 2 weeks to allow communication of the change to all laboratory staff via email and daily safety huddles. Action impact to be reviewed in 8 weeks.
Effectiveness of Action 2 • Forcing Functions e.g. physical change or control to force correct action ✓ • Automation and computerisation • Simplification and standardisation • Rules and policies • Reminders, checklists and double checks • Education and training	The action outlined above is **SMART** as there is a proposed outcome, ownership, time frames and reviews of effectiveness. It would come under for **Forcing Functions** for action effectiveness as a physical barrier is being proposed to prevent staff from being disturbed during critical tasks. Its success will also depend on staff being informed of the change and of the rationale and buy in from all staff.

*** Please note that this section was not answered in the original report to SHOT. This has been added as an example to illustrate the new section.**

SHOT resources on Human Factors and Ergonomics

- SHOT Human Factors resources (N.B. current resource listings may later be archived at this link https://www.shotuk.org/resources/archived-resources/)
  - Current resources Educational Resources - Serious Hazards of Transfusion
  - Includes SHOT Bite no.12 on Cognitive Bias here https://www.shotuk.org/resources/current-resources/shot-bites/
    - SHOT HF webinar Human Factors Resources - Serious Hazards of Transfusion
    - SHOTcast1 on HF Human Factors Resources - Serious Hazards of Transfusion
    - SHOT HF videos Human Factors Resources - Serious Hazards of Transfusion
    - Chapter from 2021 Report (includes figures and cases) 7.-Human-Factors-in-SHOT-Error-Incidents-2021.pdf
    - Transfusion related HFE e-learning module from SHOT can be accessed here: https://learninghub.nhs.uk/catalogue/NHSBT-Learning-Zone

Further information and reading about Human Factors and Ergonomics

These links are provided for information only.
Their inclusion should not be considered as approval or endorsement by SHOT.

- Clinical Human Factors Group http://chfg.org/
- NHS England Human Factors Concordat https://www.england.nhs.uk/wp-content/uploads/2013/11/nqb-hum-fact-concord.pdf
- Chartered Institute of Ergonomics & Human Factors Making Human Factors and Ergonomics Work in Health and Social Care Chapters 1 & 2 https://ergonomics.org.uk/resource/hf-in-health-and-social-care-ebook-chapter-1.html & https://ergonomics.org.uk/resource/hf-in-health-and-social-care-ebook-chapter-2.html
- Free book - *Safer Healthcare, Strategies for the Real World* by Vincent & Amalberti http://www.springer.com/gb/book/9783319255576
- Steven Shorrock's Humanistics Systems, a Human Factors blog site https://humanisticsystems.com/author/stevenshorrock/
- Erik Hollnagel's website https://www.erikhollnagel.com/
- Video produced by www.systemsthinking.com, Loughborough University https://www.youtube.com/watch?v=5oYV3Dqe0A8
- Free online course by the University of East Anglia, supplied via Future Learn, part of the Open University https://www.futurelearn.com/courses/human-factors-healthcare
- NHS Education for Scotland - Human factors and ergonomics https://www.nes.scot.nhs.uk/our-work/human-factors-and-ergonomics/
- Health Services Safety Investigations Body NHS courses NHS courses

Summary and key points

- Human factors is all about how humans interact with processes and systems
- It is common to think the individual is totally responsible for an error, but consider whether they may be working in a poor system
- Our top tip is to review all contributing factors before completing the human factors section in the SHOT Database questionnaires [Human Factors Investigation Tool (HFIT) and Training Package - Serious Hazards of Transfusion]
- It is suggested that investigators the complete the questions while investigating the event
- If in doubt, please contact the SHOT Office, SHOT@nhsbt.nhs.uk
- Phone: 0161 423 4208

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Thank you

- SHOT owes a huge debt of gratitude to all reporters for their diligent reporting and sharing their cases with us
- SHOT would like to acknowledge the Yorkshire and Humber Improvement Academy. Creative Commons Bradford Teaching Hospitals NHS Foundation Trust for the YCFF https://improvementacademy.org/about-us/
- Many thanks for reading these tips about Human Factors and we hope you have found them useful

Kind regards,

The SHOT Team

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