Human Factors in Blood Transfusion

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Summary of presentation

- Why is research needed into human factors and transfusion
- Outline of five years HF research in transfusion
- Introduction to some common HF terms
  - Resilience engineering
  - Work-as-imagined (WAI) and work-as-done (WAD)
  - Safety-I and Safety-II
- Real case studies, plus illustrative examples from life
- Conclusions and summary of lessons learnt
Risks of error in transfusion in UK (2018)

- Approximately 2.3 million components transfused each year with no complications
- 2905 error-related incidents, 1451 near misses, 216 RBRP
- 1238 errors led to patient harm
- 14 deaths

Approximate risk of preventable death: 1 in 167,000 components transfused

14 preventable = 9 error categories + 4 TACO + 1 TRALI

www.shotuk.org
Think about the daftest thing you’ve ever done

Ever lost your car in a large car park?

What really caused your error?
Reason for transfusion HF research

- SHOT key recommendation in 2013
  Annual SHOT Report, published 2014

- Process redesign: Annual SHOT data consistently demonstrate errors to be the largest cause of adverse transfusion incidents. In line with human factors and ergonomics research it may be better to redesign the transfusion process by process mapping and audit at local and national level, to design out the medical errors

Action: National Blood Transfusion Committees, working with Regional and Hospital Transfusion Committees in association with NHS England patient safety domain and equivalent organisations in the devolved countries and the National Comparative Audit Programme
Three transfusion HF studies

1. Retrospective analysis of historical SHOT incident reports using 7 known HF models

2. Creation and use of a human factors investigation tool (HFIT)

3. Prospective analysis of resilience in the hospital setting
Study 1
Retrospective assessment

Analysis of historical incidents from SHOT reports made in 2014 (n=76)

- Incorrect blood transfusion (IBCT) (n=36)
- Similar near miss (NM) cases, where the error was detected before the transfusion took place (n=40)
Existing incident reports often had insufficient HF information to make a subcategorisation.

<table>
<thead>
<tr>
<th>Categorisation</th>
<th>Number of incidents (total=76)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Errors not assessable</td>
<td>17 (Near miss) 9 (IBCT)</td>
</tr>
<tr>
<td>Errors sub-categorised</td>
<td>23 (Near miss) 27 (IBCT)</td>
</tr>
</tbody>
</table>

34.2% no HF details
Study 1: Summary

None of the HF models was suitable

In all seven models the outcome was a tendency to place responsibility for errors on individuals
Study 2: HF Investigation Tool (HFIT)

In January 2016 a human factors investigation tool (HFIT) was added to the SHOT database. Reporters were asked to assess each factor from 0=no contribution, to 10=fully responsible.

- **Staff**: Unsafe practice by individuals
- **Environment**: Unsafe local environment or workspace
- **Organisation**: Unsafe organisational/management conditions in the Trust/Health Board
- **Government/Regulatory**: Conditions in government, Department of Health or high level regulatory issues
Study 2: Scores decrease as system and organisational factors become more remote from the individual (2016)

Government & Regulatory Bodies: 4.2%
Organisation: 14.3%
Environment: 18.9%
Staff Member: 62.6%

Lower scores allocated farther away from the individual

www.shotuk.org
Self-learning

- Jan 2017 added a PowerPoint self-learning package to help reporters score the HF aspects of transfusion incidents
- Jan 2018 added a link to a video and updated the self-learning package

Statistical analysis concluded self-learning led to:
- A small reduction in attributing staff as a cause of an incident
- Strong evidence of an increase in scoring environment, organisation, and regulation as contributing to the incident
Effect of self-learning (2016-18)

Overall decrease in scores for staff members
Overall increase in scores for system factors

Reportor use of learning material

- Watched HF video (77.5%)
- Not watched HF video (22.5%)
- Read learning package (74.5%)
- Not read learning package (25.5%)
- Read learning package (75.8%)
- Not read learning package (24.2%)
- Total cases - learning material provided

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Playing the blame game

- In studies using James Reason’s decision tree for determining the culpability of unsafe acts:
  - 90% are designated as blameless, 10% culpable

The behavioural range: Incident Decision Tree guides decisions in the grey area

10% Culpable

Compare this 10% with 50-60% scores for staff in transfusion

- Sabotage
- Substance abuse
- Reckless
- System-induced violations
- System-induced errors
- ‘Honest’ errors
Study 3: Resilience

or

How do you keep the process going when things go wrong?
Demonstration of resilience

When you walk through a crowd, how often do you make minor adjustments to avoid bumping into people?
Resilient Health Care (RHC)

- RHC refers to the application of Resilience Engineering (RE) principles in health care*.
- Resilience engineering is about systems, not just building personal or team resilience.
- Understanding how people adapt to get the work done should improve health care systems - better than concentrating on improving the resilience of individuals within the system.

Work-as-imagined (WAI) compared to Work-as-done (WAD)
Definitions WAI v WAD

“Work-as-imagined (formal work) is what designers, managers, regulators, and authorities believe happens or should happen”

“Work-as-done (informal work) is what people have to do to get the job done. It is what actually happens”

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Policy

Take patient’s details to collect blood

Pictures from internet, uncredited
Transfusion process resilience

Method = walk through the transfusion process in 4 hospitals asking staff:

“Please give a short outline of the biggest or most recent difficulty that you have faced when carrying out this procedure and what did you do about the issue?”

All staff questioned (n=59) gave at least one example of a problem/adaptation and several gave more than one (n=99)

Based on: Sujan et al., 2011: Hassle in the dispensary: pilot study of a proactive risk monitoring tool for organisational learning based on narratives and staff perceptions. Quality and Safety in Health Care
Prospective review of resilience

Adaptations were seen at every stage of the nine-step transfusion process (total n=99)

Stage of the transfusion process

- Request: 17 adaptations
- Sampling: 10 adaptations
- Sample Receipt: 19 adaptations
- Testing: 11 adaptations
- Component Selection: 5 adaptations
- Component Labelling: 4 adaptations
- Component Collection: 17 adaptations
- Prescription: 3 adaptations
- Administration: 13 adaptations

Number of adaptations
Audit magic!

- That open question encourages staff to describe adaptations – they magically tell you the problem and how they solved it.

- Changes are commonly forced on staff if they feel they have to adapt to get the job done, i.e. work-as-done (WAD).

- Sometimes adaptations are a resilient improvement on the standard process, i.e. WAD matches work-as-imagined (WAI).
What is an adaptation?

If you can’t find a screwdriver… Have you ever used a knife instead?
Definitions Safety-I v Safety-II

Safety-I
as few things as possible go wrong

Avoiding things that go wrong – Reactive, learning from errors

Safety-II
as many things as possible go right

Ensuring things go right – Proactive, learning from what goes well

Vein to vein (V2V) audit being done in transfusion

(Results are from HF questions only)
Vein to Vein (V2V)

- V2V audit asks traditional clinical audit questions for each of the 9 steps in the transfusion process
- This is a Safety-I approach, searching for things that are going wrong
- The same HF questions are asked at each of the 9 steps to look at adaptations (WAD)
- This is a Safety-II method of examining an organisation’s potential for resilience in the transfusion process
Adaptations are made within the sphere of influence of staff

Preferred adaptations likely to be more resilient

- Process changed/improved due to anticipating potential failure: 38
- Managing when preferable solution is outside their control: 33
- IT design or need for change is outside their control: 16
- Coping with lack of staff or training problems: 12

Forced adaptations likely to be less resilient
Forced adaptation

You haven’t got time to sew on a button…

So you use a safety pin
Case study - Forced adaptation

- Nurse prescriber, managing transfusion dependent outpatients, assesses need for transfusion and posts a request form for pre-transfusion sample to be taken.

- Standard process is for posting to be done by the hospital administration team, but this causes delays.

- If urgent transfusion is required, the nurse buys own stamps for posting.
Preferred adaptation

You usually go to work on a crowded, draughty bus

But you have to work Xmas Day, so you get a personal, warm taxi
Case study - Preferred adaptation

- Patients on the day ward were increasing the flow, so their transfusions finished more quickly.
- This puts patients at risk of transfusion associated circulatory overload (TACO), a life-threatening complication.
- Introduced programmable pumps to stop patients increasing flow.
Triggers v Adaptations

Triggers: IT & Staff

Number adaptations triggered by
- 21 Tools IT
- 16 Tools Non-IT
- 30 Person(s)
- 10 Internal environment
- 4 Task
- 14 Process

Number adaptations made through
- 28 Tools IT
- 13 Tools Non-IT
- 42 Person(s)
- 7 Internal environment
- 5 Task
- 16 Process

Watt et al., 2019. Resilience in the blood transfusion process. Safety Science

Successful/acceptable
Unsuccessful/unacceptable
Outcome

Work-as-Done

Demand
Capacity
Work-as-Imagined

Person(s)
Organisation/management
Process
Task
Tools IT
Tools Non-IT
Adaptations go unnoticed

Follow up question: "How supportive was your manager or department for how you solved the issue?"
Graded:
5 - very supportive
1 - very unsupportive
N/A – not applicable

Outcome:
N/A n=73, 73.7%
Adaptations often made without approval from management or colleagues

Score 0, not applicable - 73 (73.7%)
Score 1, very unsupportive - 4 (4%)
Score 2, fairly unsupportive - 2 (2%)
Score 3, neither supportive/unsupportive - 1 (1%)
Score 4, fairly supportive - 3 (3%)
Score 5, very supportive - 16 (16.2%)
Resilience in the blood transfusion process: Everyday and long-term adaptations to ‘normal’ work

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Summary and Conclusions

- Human factors and ergonomics is about making it easy to do the right thing.
- Incident investigations should look at the system failures, not just the staff.
  
  **Ask how, what, why, where, when before asking who**

- If another person could make the same mistake, then the system is at fault, not the person - retraining/reminding seldom works.
- Audit what goes right, such as good adaptations, as well as what goes wrong.
Making it easy to do the right thing

Red stripe on wall so emergency buzzers can be located easily
But how human, that someone has stuck a piece of paper over it
Many thanks for your attention

“We must accept human error as inevitable - and design around that fact.”

Don Berwick


Berwick review into patient safety, 2013
Healthcare has only recently started to utilise human factors, compared to industries like aviation that have applied these principles for over three decades.

Jarobe Healthcare Human Factors is a consultancy business that aims to promote an understanding of human factors.

Jarobe’s consultant is a highly qualified healthcare scientist with over 30 years experience, specialising in error reduction through research into the application of human factors.

Jarobe offers a flexible range of solutions for healthcare organisations to develop their processes and improve safety through an understanding of human factors.

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