

# Enhancing Safety in Cardiac Surgery: The Potential Impact of Human Factors Training

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# Objectives

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1. Definition and background
2. Key concepts
3. Relevance to CTS
4. HF in Medicine
5. EPICC®
6. Conclusions

# What are Human Factors?

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Human factors encompasses all those factors that can influence people and their behaviour. In a work context, human factors are the environmental, organisational and job factors, and individual characteristics which influence behaviour at work.

*Based on UK Health and Safety Executive (Reducing error and influencing behaviour, HSG48, 2005, HMSO)*

# Background

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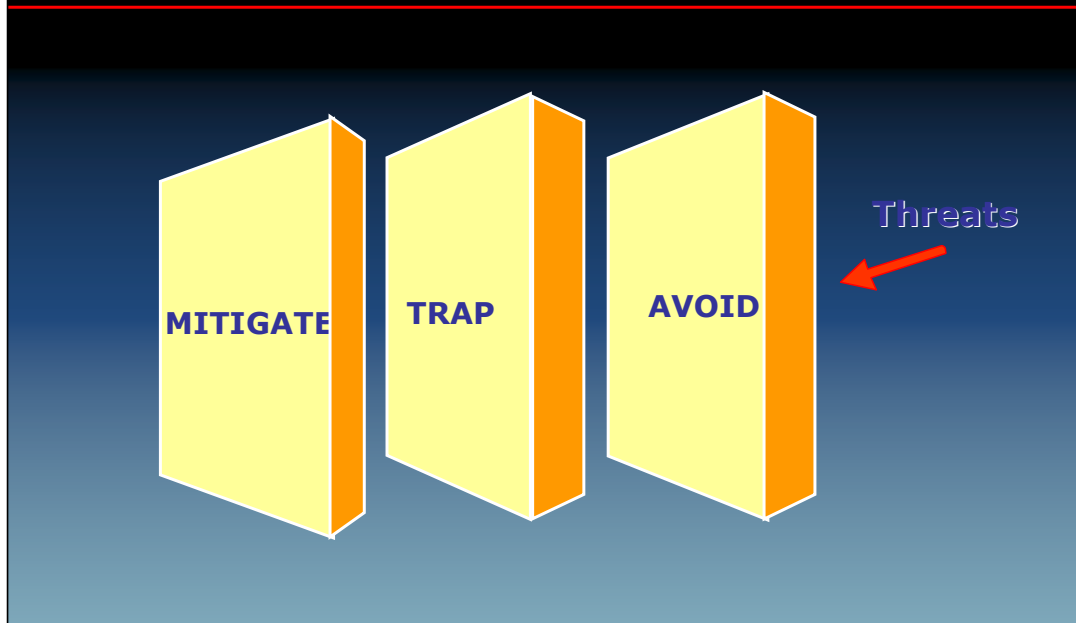
- 1979 – outgrowth of NASA research IDs HF as primary cause of air disasters (estimates currently 70-98%)
- By 1990s, HF training key component of aviation training and assessment
- Evidence from simulation and course evaluation demonstrate sustained improvements in flight safety

# Key Concepts

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1. Threat and error management
2. Limitations and error
3. Situational awareness

# Threat & Error Management



Helmreich and Musson's theory of Threat and Error Management says that in an ideal state teams would think of everything that could go wrong and have a plan to Avoid it. This is the rationale behind a team briefing where everyone should be encouraged to participate actively.

However you can't think of everything so you need a robust effective team to Trap threats and errors. This is when a checklist comes into play to prevent missing or forgetting something, but you also need a team empowered to assert their doubts and questions without threat of inappropriate hierarchical behaviour.

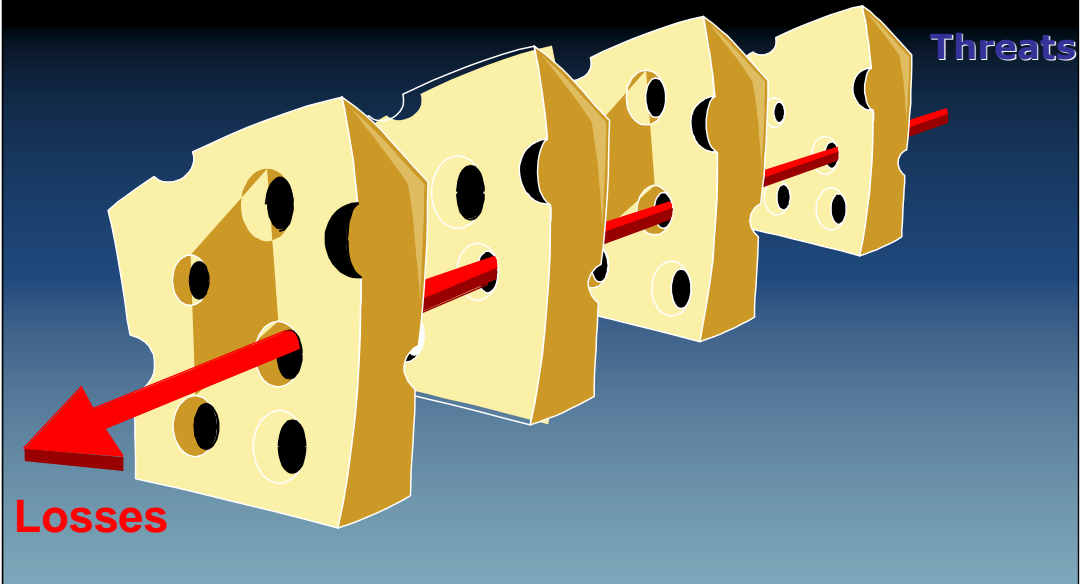
Finally mitigating the problem – this is where debriefing applies to capture what worked well and what did not. You don't need management consultants to tell you what works and what doesn't – you just need an educated motivated team who are listened to and responded to without threat of disciplinary action if genuine human errors are made..

The University of Texas Threat and Error Management Model: Robert L. Helmreich Ph.D.; David M. Musson, M.D. Department of Psychology The University of Texas at Austin Published on the British Medical Journal Web Site ([www.BMJ.com](http://www.BMJ.com))

# Threat & Error Management



# "Swiss Cheese" Model – Prof. James Reason





## **Case study 2: Wrong site surgery**

Carmarthenshire NHS Trust

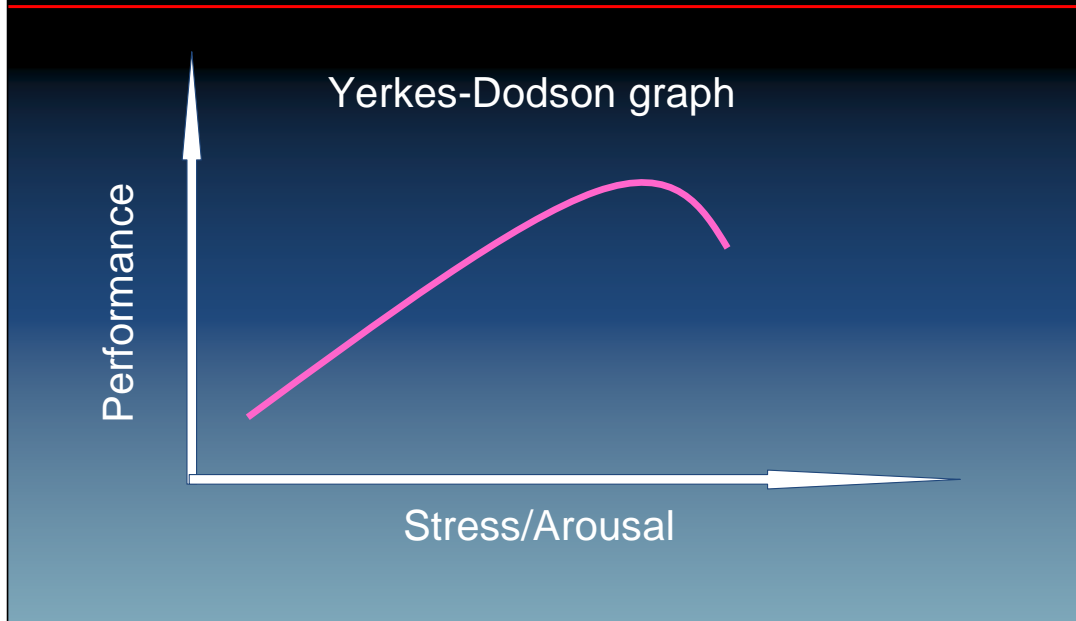
A patient was admitted for right nephrectomy. Due to a clerical error the admission slip stated 'left'. The operating list was transcribed from the admission slips. The patient was not woken from sleep to check the correct side on the pre-operative ward round. The side was not checked from the notes or consent form.

The side was questioned by the consultant surgeon on the patient's arrival in theatre but was not confirmed. The consultant instructed the SpR to carry out the operation. The consultant mistakenly put the correctly labelled x-rays on the viewing box back to front. The consultant supervised the positioning. The SpR did not check the side and was not alerted to this being the wrong site by noticing the normal pulsation in the renal artery of the kidney he was removing.

A medical student observing the operation suggested to the SpR that he was removing the incorrect kidney but was told by the SpR that she was wrong.

The mistake was not discovered until two hours after operation. The patient later died.

# Limitations and error



When we wake up, before our first cup of tea, there is probably not much performance due to low arousal. As the day goes on and we arrive at work we need to move up the curve to an optimum position. How do we achieve this? How do we get the Team working in the optimum area? – Briefing!

The reason the curve ends abruptly on the right is that as people go in to overload, their response will vary with their personality and the level of stress. They are in an area of fight/flight/freeze. They are incapable of logical reasoning. They are into black and white thinking.

How do we prevent team members being pushed over to the right? Briefing; they have a better understanding of how the day will run. They will better understand their role and their responsibilities.

# Situation Awareness

## Red Flag Behaviours

- Disagreement between 2 sources of information
- Fixation on a single task to exclusion of all else
- Confusion or uncertainty not resolved
- Failure to adhere to accepted practice
- Failure to comply with warning signs
- Failure to communicate effectively
- Leading questions
- Something doesn't feel right.



Do you ever have any one of these happen to you or your team?  
These are classic signs of things going wrong – loss of situation awareness.

# HF In Medicine

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- Slow
- First flight safety checklist 1937
- WHO Surgical Safety Checklist 2008

# Advanced Life Support

# Human Factors and Quality in Resuscitation

CHAPTER

# 2



### Learning outcomes

To understand:

- ▶ The role of human factors in resuscitation
- ▶ How to use structured communication tools such as SBAR and RSVP
- ▶ The role of safety incident reporting and audit to improve patient care

### Human factors

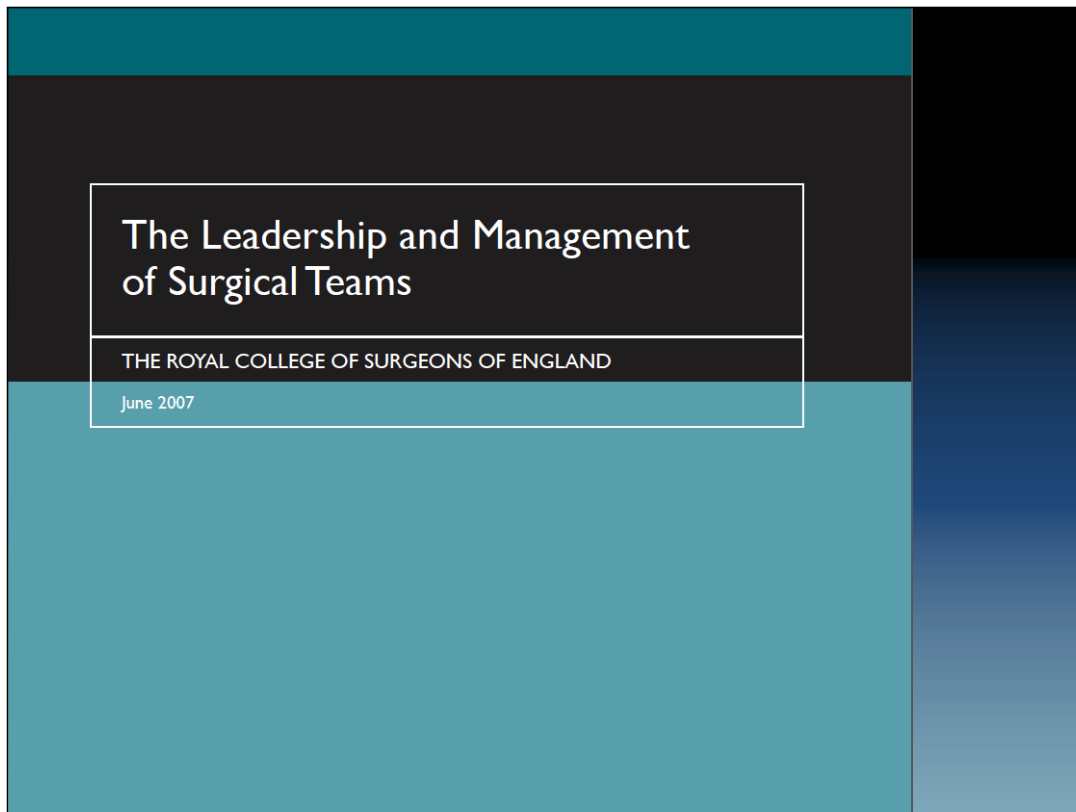
The skills of chest compressions, defibrillation, intravenous cannulation and rhythm recognition are considered typically to be the most important factors in managing a cardiac arrest. These are all technical skills that are learnt from books, lectures, courses and peers. Although they are important for the successful resuscitation of a patient, there is another group of skills that is becoming

### Situational awareness

This can be described as an individual's awareness of the environment at the moment of an event and the analysis of this to understand how an individual's actions may impact on future events. This becomes particularly important when many events are happening simultaneously, e.g. at a cardiac arrest. High information input with poor situational awareness may lead to poor decision making and serious consequences. At a cardiac arrest, all those participating will have varying degrees of situational awareness. In a well functioning team, all members will have a common understanding of current events, or shared situational awareness. It is important that only the relevant information is shared otherwise there is too much distraction or noise. At a cardiac arrest, important situational awareness factors include:

- consideration of the location of the arrest, which can give clues to the cause;

Introduction into medicine  
Chapter 1 ALS – HF



6 years ago this section on HF was written by AEB Giddings and C Williamson.  
Tony Giddings was patient safety rep on Council at RSCEng and pushed hard for HF training.  
He co-authored SLIPS course with Trevor Dale and G Hirst -(Safety & Leadership in Interventional Procedures and Surgery).  
Original research was done in Great Ormond Street with Prof Marc de Leval who had been on Enquiry Team at Bristol baby death enquiry.  
Maxfax, vasc, neuro over 112 ops  
51 pre intervention, 61 post  
2 days classroom, 6 days theatre  
More time outs, briefings, debriefings

Original research



## Identifying and categorising patient communication-related

the recommended communication practices (repeat backs, call-outs, confirmation, structured communication techniques) were rarely followed. Delays or ambi-

## Interdisciplinary approach: a multisite study

Communication-related hazards were prevalent. In the majority of cases, briefings/time-outs and debriefings

were either not performed or incompletely performed. <sup>1,2,5</sup> Jill Marsteller, <sup>1,2,4,6</sup>

Laura Bauer, <sup>2</sup> Lisa H Lubomski, <sup>1,2</sup> Peter J Pronovost, <sup>1,2,4,7,8</sup> David Thompson <sup>1,2,7</sup>

- Train cardiovascular operating room care providers in teamwork skills, such as being assertive, inquiring when necessary, effectively sharing pertinent information and mental models, etc.

BMJ Quality Safety 5 month study, 5 US hospitals, 20 cardiac surgeons, 58 hazard categories. HFs “ubiquitous,” multiple HF errors

# Error Prevention In Complex Care

## EPICC<sup>®</sup>

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- Tools to Avoid error – briefing
- Tools to Trap error – checklists and assertion skills
- Tools to Mitigate error – debriefing and feedback
- Simulation and role play
- Debriefing by Human Factors experts

This is the essence of the EPICC course:

Full content is how we get things wrong and what we can do about it.

Briefing is the key to agreeing leadership and other roles, building the team, building a high shared level of situation awareness, establishing experience and skill levels, task delegation to the most appropriate person and having a shared plan A – what should happen and Plan B what could conceivably go wrong.

Trapping error is where sorting out appropriate behaviour and hierarchy and agreeing how and when team members can intervene and how they will be assertive. In a surgical setting checklists are appropriate here.

Mitigation is about preventing the same threats and errors happening again and again by encouraging debriefing not just of what went wrong if any but what was positive, what people did to help get it right. Often team members don't get specific praise and so they don't know what they have done that's been helpful.



# Methods

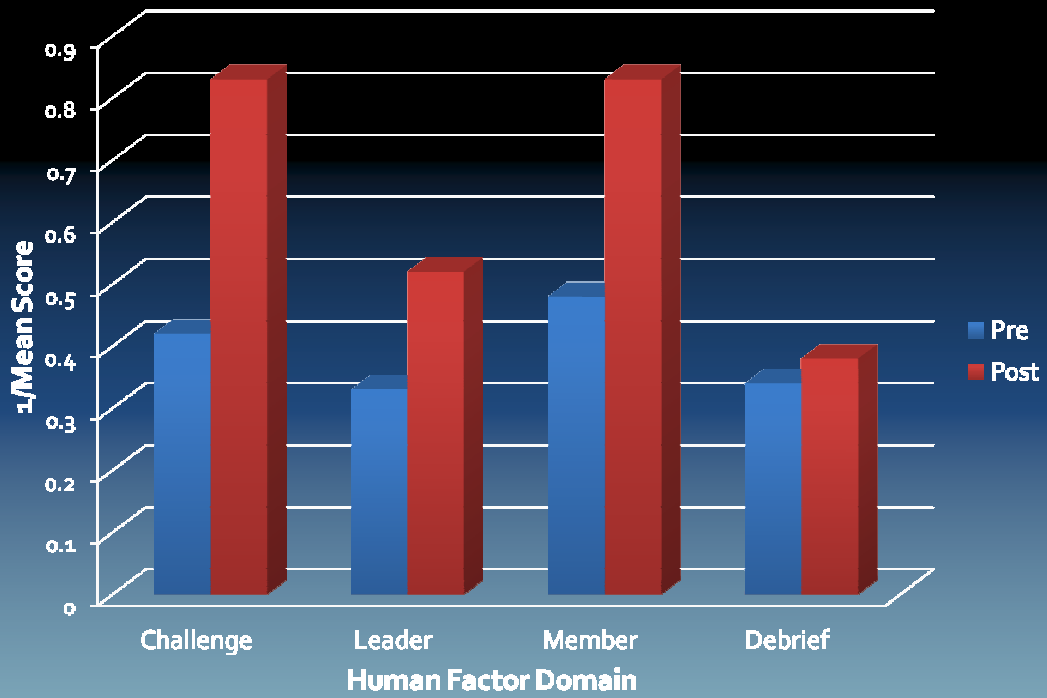
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- Retrospective assessment of feedback from 50 participants on EPICC® (EM)
- Before and after competencies
- 1-5 scale (1 = maximum confidence)

# Results

Human Factor Domain	Mean Score Pre-Course (Mode)	Mean Score Post-Course (Mode)	Significance
Challenging the Team Leader	2.4 (2)	1.2 (1)	P<0.05
Being a Team Leader	3.0 (3)	1.9 (2)	P<0.05
Being a Team Member	2.1 (3)	1.2 (1)	P<0.05
Conducting a Debrief	2.9 (3)	1.6 (2)	P<0.05

## Mean Confidence Scores



# Discussion

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- Results of 1 day intervention suggest significant improvements in basic HF skills
- Consistent with other data
- Slow integration into medicine and surgery
- Increasing awareness of the role of HF errors in CT surgery
- ? Time for integration of HF into CTS MDT training

# Questions?



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