

Human Factors Recognition to Enhance Team Working and Safer Patient Care

42

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42.1 Introduction

Human error and organisational mistakes are a significant cause of morbidity for patients. It is important to recognise and address human factors (HF) in the context of our own performance optimisation, enhancing team working to improve patient safety, and better working lives for clinicians across surgery and medicine.

Medical errors are usually multi-factorial rather than the direct fault of any one individual. Organisational issues, poor team working and other HF are often at the root of many incidents and errors. The Surgical Checklist produced by the World Health Organization (WHO), and aviation-styled communication training initiatives have been advocated to optimise surgical performance by reducing human fallibility and misinterpretation between team members. Brief and debriefing processes and other performance improvement practices have been positively rated when incorporated into healthcare. Ergonomics and other factors such as stress and fatigue, emotional status, hunger, dehydration and situational awareness can all lead to human error, but these are often under-appreciated and in some cases even disregarded.

The aims of this chapter are to raise colleague awareness of both individual human factors and those relevant to organisations and to highlight relatively simple methods to actively reduce error in healthcare.

42.2 The Scale of the Problem

Over 70% of plane crashes are due to a human mistake rather than a failure of the aircraft itself. Issues with communication can occur in up to 80% of air disasters. Recognition of factors leading to human error, including tiredness, stress, and repetitive tasks, and an acceptance that a certain degree of failure is almost inevitable, has improved air safety. These factors are being increasingly recognised by healthcare professionals [1]. The American Institute of Medicine report entitled “To Err Is Human” published in 1999 and subsequent work has found death from preventable medical errors, with those in surgery second only to medication errors as the most common reasons for death from medical error [2]. Recent estimates place avoidable patient deaths in USA hospitals at over 400,000 per year, with preventable harm in the top three causes of death [3].

While the authors were not able to source any statistics for the Indian sub-continent, death in UK hospitals from medical error is estimated to be about 4000 per year, with a disproportionate amount of harm caused by errors in surgery. To put this into context, this would be the equivalent of more than one A320 fatal airbus (Fig. 42.1) crashes occurring twice a month. Incidentally, the A320 is the aircraft involved in the widespread media coverage after an emergency landing on the River Hudson in January 2009 by Captain ‘Sully’ Sullenberger, subsequently dramatized in the well-known movie, *Sully*. Despite the WHO checklist, which is widely used throughout the modern world, the number of ‘never events’—those that should never happen, including wrong site surgery and retained instruments or swabs—is increasing [4]. Although doctor-induced mistakes are quite rare, a near miss occurs far more commonly in the hospital environment. An investigation and detailed cause analysis following any incident can help organisations learn, prevent and reduce the chance of such errors occurring again in the future.

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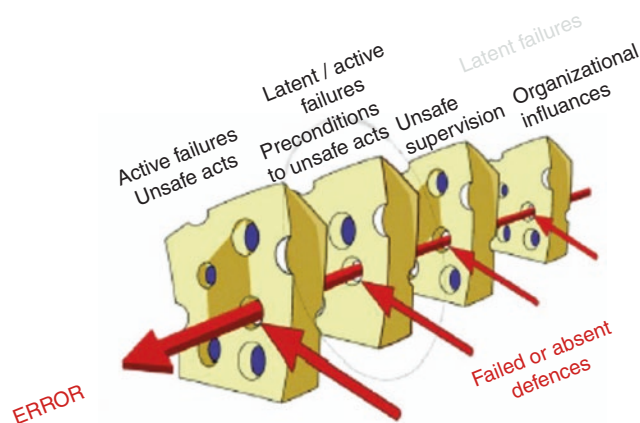
Fig. 42.1 The flight deck of an Airbus A320 being configured for departure

42.3 How Do Human Errors Arise?

Recognition and understanding of those relevant HF involved in potential error is vital for improving patient safety. These factors include fatigue and tiredness, stress, communication style, effective team working, and good leadership. The well-known ‘Swiss cheese model’ of error (Reason [5]) is illustrated in Fig. 42.2. Organisational failures contributing to medical error could include pressures on individuals to meet hospital targets, having too many patients on an operating list than is deemed safe, too many patients in an outpatient clinic, working very long hours without taking a break or being expected to operate the following day after having being disturbed overnight with on-call emergencies.

42.3.1 Senior Management Support Is Essential in Helping to Reduce Medical Error

Senior management commitment is essential in ensuring safety across any organisation. An open culture has to be key in any hospital agenda and strategy. Poor leadership together with a ‘blame culture’ led to more than 35 deaths in the Bristol paediatric cardiac surgery service. As a result, a large number of changes were implemented to limit future preventable surgical incidents. Pilots, aircraft ground engineers and other aviation safety staff are encouraged to actively question any safety issues related to their aeroplane, and their employer must investigate concerns, even if this means stopping a flight from taking off. In healthcare, we should be following this safety model with higher hospital management and surgical team leaders creating a safe environment



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Fig. 42.2 Schematic representation of the Swiss cheese model of human error. Each of the cheese slices acts as a barrier to an error occurring with the final chance for stopping the error being the elimination of the unsafe act itself. Error has its origin in organisation influences (latent failure) and those caused by individuals and teams (active failures)

Table 42.1 Avoiding human error traps

- Read out WHO Checklist with active participation of all team members. Engage with it as if your own life or limb depended on getting it right
- Ensure staff communicate well with each other
- Use briefing/debriefing to improve team working
- Limit avoidable distractions and any interruptions during essential parts of an operation (same as sterile cockpit in aviation).
- Promote use of positive two-way communication.
- Ensure 6–8 h of sleep, regular physical activity and adequate nutrition and hydration before starting surgery.
- Look out for each other as part of the team.
- Ensure you take regular breaks and eat and drink often during the day.
- Recognise when something doesn't seem right in yourself.
- Do not assume physically uncomfortable postures unless absolutely necessary. Adjust equipment, table for the comfort of you and your team.

Table 42.2 Take special care—recognise situations in which error/harm is more likely

- Site- and side-specific procedures
- Staffing limitations high turnover rates
- Changes in physical environment
- Changes in staff/scheduling
- Staffing limitations
- High staff turnover
- Significant changes in life situation of team members—divorce, death in family
- Special patient factors, e.g. Jehovah witness unable to accept transfusion, obesity

to report and action possible error. The surgical team has to endorse the use of evidence-based best practices, including use of the WHO Surgical Checklist, avoiding human error traps (Table 42.1) and early identification of those situations in which harm or error is more likely to occur (Table 42.2).

While a surgeon's life or limb is not at stake during an operation (unlike an air disaster when a mistake made by an airline pilot might result in the death of all those on board, including the crew), the psychological effects of a major surgical incident or error can be devastating to both individuals and teams [6].

42.3.2 Human Factors That We Should Be Thinking About

There are many personal human factors that can cause error, including tiredness and fatigue, nutritional status, anger and stress, multitasking and loss of our own situational awareness. However, all too often as individuals we sometimes imagine that these factors do not apply to us, and therefore we might choose to ignore them (such as missing lunch, working for many hours without taking a break) significantly raising the risk of patient harm and potentially damaging our own health and well-being.

42.3.2.1 Fatigue and Tiredness

These are known in aviation and other high-risk organisations (HROs) as significant factors that can cause human error. As a result, strict guidelines have been put in place in these HRO, with for example flight crews only being working a defined number of hours in any given month. Many airlines have a policy in place to make sure that one pilot is as refreshed as possible for the most dangerous aspects of flying such as the landing. Intense concentration can only be maintained for about 20–30 min. For example, one pilot will take over the actual landing when the other has done the first-stage descent. The effect of these personal factors in surgical performance is less understood than in aviation though tiredness will affect decision making, as well as doing complex tasks. Situational awareness will also be affected even if surgeons behave as if they are immune and operate for many hours without taking a break. The ability for sleep deprivation to degrade performance is dramatically under-estimated by healthcare providers [7].

With reference to the Swiss cheese analogy, tiredness, emotional factors and stressful surgery can all align together to raise the risk of serious error. Table 42.2 shows some of these high-risk situations. Good communication and team working and the ability to question decisions with a phrase such as 'can I check that I've got this correct' can be useful. Other phrases like 'I am not happy' and 'I am going to take over' can also be used in situations where an error might happen.

42.3.2.2 Nutritional Status and Hydration

These factors significantly affect HF and our performance in a demanding operating room setting. Even modest levels of

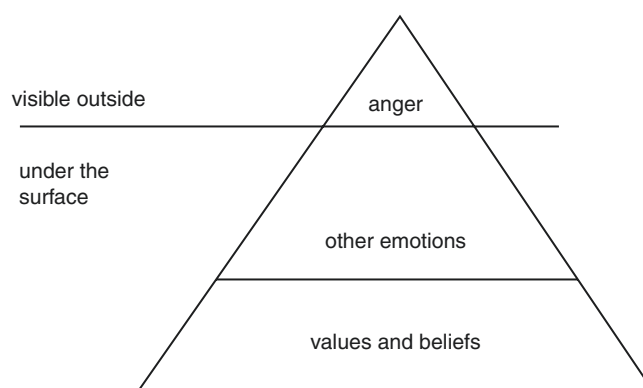
dehydration are known to impair cognitive function and performance [8]. Meals that contain protein, carbohydrates and fats such as those derived from olive oil, fish and avocado as well as certain nuts are considered to be best for optimal nutrition. Simple sugars (such as chocolate bars) and processed food do not readily support long-term concentration and the endurance that is needed in the operating theatre [8].

The authors recommend taking a short break of 10–15 min every 2–3 h when at work, especially if performing complex tasks or surgery. Of course, the procedure can continue if there is suitable expertise within the team, but each team member should plan to take a regular break, which can be staggered. Even a short time spent away from operating can help provide a fresh outlook, improve morale, and enable a toilet and food/water break. Recovery is aided through regular sleep, which is positively linked to healthy eating and drinking. Certain nutritional supplements may also support performance [9].

42.3.2.3 Stress and Emotions While We Are Working

Emotional and psychological issues can affect performance. While these emotions can often be hidden, a trigger or so-called sentinel event that results in upset or even anger can occur, during times of high mental workload or in those stressful situations that we all will be familiar with. Many of us will have witnessed others (or ourselves) having an emotional outburst, including shouting at other team members. During these events, error is much more likely to occur. In these situations, visible anger usually results from additional hidden factors that others do not see in the so-called anger triangle (Fig. 42.3).

A simple thing to remember, **HALT** (Table 42.3), reminds us of sometimes overlooked personal issues and to ensure we stop to take a break. The importance of a short rest cannot be emphasised enough if it is safe, especially when these HALT



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Fig. 42.3 Anger triangle: many emotions may be hidden from others until a sentinel event causes an outburst of anger. During this time, error is much more likely

Table 42.3 Try to stop or inform a member of the team when experiencing or witnessing these HALT factors

H	Hungry
A	Angry or anxious
L	Lonely or late
T	Tired

issues becomes apparent, and may prevent something serious from occurring.

Management strategies such as increasing our own emotional awareness and learning how to deal with personal stress may also be useful.

Effective communication with the rest of the team and questioning decisions where there might be some doubt by saying something like ‘can I check that I have got this right?’ is paramount. Other words such as ‘I’m not happy’ and ‘I’m going to take over’ can also be used in situations where potential errors are deemed more likely.

42.4 What About WHO and Other Checklists and Team Working Dynamics on Surgical Performance?

The WHO Surgical checklist has resulted in significant decreases to post-operative mortality and morbidity on a worldwide scale, yet errors persist and recur. While checklists, including WHO’s, cannot address all aspects of medical and surgical practice, good team working with effective briefing can help to optimise team performance. There are many situations in surgery and other medical specialities when mental or physical workloads increase suddenly or dramatically (for example, during complex microvascular reconstruction) and these can have an adverse effect on performance. In such cases, team dynamics and an understanding of each individual’s role within the wider team are crucial. Airlines enforce a ‘sterile cockpit’ policy in which noise is kept to only essential conversation below 10,000 ft (during high-risk procedures such as landing and take-off) and only essential conversation relating solely to procedure is permitted. The sterile flight deck concept is being advocated for reducing error in anaesthesia and surgery [10]. This should be discussed with all team members at the pre-operative briefing so that all know the need to stop non-essential communications at certain times. Poor team working has had tragic consequences on many occasions. In one well-known UK case (Elaine Bromiley), the airway was lost following induction of anaesthesia for a routine ENT procedure. The anaesthetists made repeated attempts to secure an airway, and had ‘tunnel vision’ about this rather than seeking assistance from surgeons or others for an emergency needle cricothyroidotomy.

Ancillary staff were well aware of the patient’s prolonged hypoxic state but felt reluctant to assert themselves or state the need for alternative intervention. No individual took a leadership decision role and the team did not have designated roles during a difficult airway situation. As a result, the patient died when she could so easily have been saved. Lack of leadership, poor communication, inability to challenge hierarchy, and many other HF failings were to blame for this tragedy.

Effective team working is also valuable in promoting a sense of shared responsibility for patient safety. Team performance is often improved when front line staff actively monitor important performance criteria such as blood loss, regular swab counts, and needle and instrument checks.

The WHO checklist and other team tools have helped with theatre safety; however, never events still continue to occur [4]. Much more is needed around safer team interactions. The team brief, coupled to a debriefing after the day’s operating, can enhance patient care, team working and feeling valued by all.

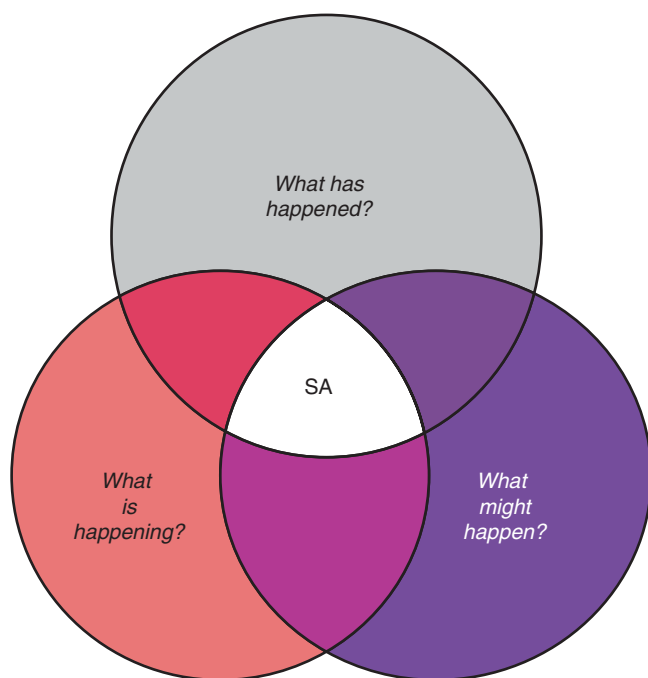
Airline pilots discuss the ‘what if?’ scenario in pre-flight briefings and know who will be doing what if something doesn’t go well (Fig. 42.4). Some clinicians even go as far as to ask team members ‘how could we kill this patient today?’ Table 42.4 summarises items that could be included in a good briefing and debriefing. The nominated team leader can summarise what has been discussed and repeat back as necessary to confirm to everyone that there is shared understanding. We also suggest monitoring each other for signs of loss of situation awareness as well as looking for features of tiredness and fatigue.

An open culture and respect by all team members are crucial for better team working and enhancing patient safety. Even the most inexperienced pilot will question decisions of senior Captains without fear. While a hierarchal gradient between trainees and their boss is needed, this should be sufficiently flat to allow and encourage them to speak up when something does not seem right. At all times, this needs to be done in an environment where there is no fear of retribution for speaking up about something that may appear trivial.

This concept is important in the team brief so that students, trainees, and nurses all feel valued. We need to be aiming for a ‘smooth and enjoyable flight’ in our workplaces, even if the view isn’t as exciting as from the flight deck.

42.5 Situational Awareness

An important HF principle is recognising and understanding how we relate and behave and how changes over time. Surgeons can sometimes develop tunnel vision during long procedures. This can be confounded by indicators that they recognise confirm their behaviour, and thus may need to rely



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Fig. 42.4 The three key elements that comprise situational awareness (SA)

Table 42.4 Things to consider at a team brief

A well-prepared team knows their role, looks out for each other and helps all to feel valued.
<i>Briefing</i>
Introductions, transparent culture, ‘anyone can speak if concerned’
Team working and leadership
Identify major parts of surgery and who is going to do what
Ask ‘What am I going to do if something goes wrong?’
Situation awareness—how can I intervene when something doesn’t seem quite right
Decision-making skills
<i>Debriefing</i>
<ul style="list-style-type: none"> • What went well today? • One thing I (we) could do more of? • One thing I (we) could do less of? • What will I (we) do differently next time? • Saying ‘Thank you’ to everyone

on other team members to identify a problem. Losing track of time is one factor, which can lead to catastrophic consequences as highlighted by the Elaine Bromiley incident mentioned earlier. An otherwise competent team lost their situational awareness as critical minutes passed by during failed intubation attempts. Her husband Martin (airline pilot) knew about the same tunnel vision from a fatal plane crash, where a prolonged attempt to troubleshoot a landing light warning and a crew member’s failure to assertively communicate led to the plane running out of fuel.

A lack of situation awareness causes many diving accidents. Recognising it for ourselves is important for develop-

ing surgical skill and where possible stopping what we are doing when things do not seem quite right. A well-briefed team will be able to recognise at a much earlier stage when something is not quite right [11].

A simple diagram showing the three key components of situational awareness is shown in Fig. 42.4.

42.6 HF Training When Not in the Operating Theatre

Technology developments have led surgeons to perform increasing minimally invasive procedures. Physicians also do more invasive procedures such as interventional radiology (IR), percutaneous coronary techniques and gastrointestinal endoscopic surgery. The lessons learnt from surgery and team briefs, WHO checklists and other HF training initiatives should be applied to other parts of the hospital.

Medicine is a challenging activity and patients are far more complex than aircraft. Greater control is needed wherever possible to minimise the risk of harm to others as a result of human error. HF training can readily be taught across medical practice leading to widespread improvements in safety. It is clear that any HF training includes important safety concepts, including better communication in teams, a culture of open reporting without blame, regular safety briefings and leadership skills. Aviation-based ‘Crew Resource Management CRM’ training has improved reduction in wrong site surgery. Hospitals need to recognise that they can influence attitudes, culture and values towards patient safety. HF training is simple, cost-effective and deliverable way of getting all staff members involved.

42.7 Conclusion

HF and better team working, as well as commitment towards continual performance improvement, are increasingly recognised as essential aspects of patient safety. Despite this, serious medical errors have not been abolished. Many errors can be prevented by recognising and using simple measures in our clinical practice. An appreciation of those factors that affect each of us as being potential contributors to error is a great step towards improving safety for our patients.

We believe and advocate that HF training is essential for medical staff as it is for airline employees. Since the introduction of compulsory HF training in the early 1990s, there has not been a single death on a UK-based airline due to human error in more than 3 billion passenger journeys. An individual would have to fly every day for 38,000 years before experiencing a human error-related aviation catastrophe. Surely we owe it to our patients to do everything we can to improve their safety too?

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